

Youth Competition Times

NTA/UGC-NET-JRF/SET

COMPUTER SCIENCE

&


APPLICATIONS

Solved Papers

(Also Useful for Other State Level Competitive Examinations)

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NTA/UGC-NET Syllabus

New Pattern

As per the revised scheme, the test will consist of two papers as below:

Paper	Marks	Number of Questions	Duration
I	100	50 questions. All are compulsory	1 Hour (09:30 AM to 10:30 AM) IST
II	200	100 questions. All are compulsory	2 Hour (11:00 AM to 1:00 PM) IST

Paper-I Shall consist of 50 objective type compulsory questions each carrying 2 marks. The questions which will be of general nature, intended to assess the teaching/research aptitude of the candidate. It will primarily be designed to test reasoning ability, comprehension, divergent thinking and general awareness of the candidate.

Paper-II Shall consist of 100 objective type compulsory questions each carrying 2 marks which will be based on the subject selected by the candidate.

All the questions of Paper – II will be compulsory, covering entire syllabi of earlier Paper II & Paper III (including all electives, without options).

SYLLABUS FOR PAPER-II

1. Discrete Structures : Sets, Relations, Functions, Pigeonhole Principle, Inclusion-Exclusion Principle, Equivalence and Partial Orderings. Elementary Counting Techniques. Probability. Measure(s) for information and Mutual information. *Computability*. Models of computation – Finite Automata, Pushdown Automata, Non-determinism and NFA, DPDA and PDAs and Languages accepted by these structures. Grammars, Languages, Non-computability and examples of non-computable problems.

Graph. Definition, walks, paths, trails, connected graphs, regular and bipartite graphs, cycles and circuits, tree and rooted tree. Spanning trees. Central Graphs. Centre(s) of a tree. Hamiltonian and Eulerian graphs, Planar graphs.

Groups. Finite fields and Error correcting/detecting codes.

2. Computer Arithmetic : Propositional (Boolean) Logic, Predicate Logic, Well-formed-formulae (WFF), Satisfiability and Tautology.

Logic Families. TCL, ECL and C-MOS gates. Boolean algebra and Minimization of Boolean functions, Flip-flops-types, race condition and comparison. Design of combinational and sequential circuits.

Representation of Integers. Octal, Hex, Decimal and Binary. 2's complement and 1's complement arithmetic. Floating point representation.

3. Programming in C and C++ : *Programming in C*. Element of C– Tokens, identifiers, data types in C. Control structures in C. Sequence, selection and iteration (s). Structured data types in C–arrays, struct, union, string and pointers.

O-O Programming Concepts. Class, object, instantiation. Inheritance polymorphism and overloading.

C++ Programming. Elements of C++ – Tokens, identifiers. Variables and constants, Data types, Operators, Control statements. Functions parameter passing. Class and objects. Constructors and destructors. Overloading, inheritance, templates, exception handling.

4. Relational Database Design and SQL : E-R diagrams and their transformation to relational design, normalisation – 1 NF, 2NF, 3NF, BCNF and 4NF. Limitations of 4NF and BCNF.

SQL. Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL) commands. Database objects like–views, indexes, sequences, synonyms, data dictionary.

5. Data and File Structures : Data, information, Definition of data structure. Arrays, stacks, queues, linked lists, trees, graphs, priority queues and heaps.

File Structures. Fields, records and files. Sequential, direct, index sequential and relative files. Hashing, inverted lists and multi-lists. B trees and B+ trees.

6. Computer Networks : *Network Fundamentals*. Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Wireless Networks. Inter Networks.

Reference Models. The OSI model, TCP/IP model.

Data Communication. Channel capacity, Transmission media–twisted pair, coaxial cables, fibre-optic cables, wireless transmission-radio, microwave infrared and millimetre waves. Lightwave transmission. The Telephones – local loop, trunks, multi-plexing, switching, narrowband ISDN, broadband ISDN, ATM, High Speed LANS. Cellular Radio. Communication satellites–geosynchronous and low-orbit.

Internetworking. Switch/Hub, Bridge, Router, Gateways, Concatenated virtual circuits, Tunnelling, Fragmentation, Firewalls. Routing: Virtual circuits and datagrams. Routing algorithms. Congestion control.

Network Security. Cryptography – public key, secret key. Domain Name System (DNS) – Electronic Mail and World Wide Web (WWW). The DNS, Resource Records, Name servers, E-mail-architecture and Servers.

7. System Software and Compilers : Assembly language fundamentals (8085 based assembly language programming). Assemblers-2-pass and single-pass. Macros and macroprocessors.

Loading, linking, relocation, program relocatability. Linkage editing. Text editors, Programming Environments, Debuggers and program generators.

Compilation and Interpretation. Bootstrap compiler. Phases of compilation process. Lexical analysis. Lex package on Unix system.

Context free grammars. Parsing and parse trees. Representation of parse (derivation) trees as rightmost and leftmost derivations. Bottom up parsers–Shift–reduce, operator precedence and LR. YACC package on Unix system.

8. Operating Systems (with Case Study of Unix) : Main functions of operating systems, Multiprogramming, multiprocessing and multitasking.

Memory Management. Virtual memory, paging, fragmentation.

Concurrent Processing. Mutual exclusion, Critical regions, lock and unlock.

Scheduling. CPU scheduling, IO scheduling, Resource scheduling, Deadlock and scheduling algorithms. Banker's algorithm for deadlock handling.

UNIX. The Unix System File system process management, bourne shell, shell variables, command line programming.

Filters and Commands. Pr, head, tail, cut, paste, sort, uniq, tr, join, etc., grep, egrep, fgrep, etc., sed, awk, etc.

System Calls (like). Create, open, close, read, write, isseek, link, unlink, fstat, umask, chmod, exec, fork, wait, system.

9. Software Engineering : System Development Life Cycle (SDLC). Steps, water fall model, Prototypes, Spiral model.

Software Metrics. Software Project Management.

Software Design. System design, detailed design, function oriented design, object oriented design, user interface design. Design level metrics.

Coding and Testing. Testing level metrics. Software quality and reliability. Clean room approach, software re-engineering.

10. Current Trends and Technologies : The topics of current interest in Computer Science and Computer Applications shall be covered. The experts shall use their judgement from time to time include the topics of popular interest, which are expected to be known for an application development software professional, currently, they include:

Parallel Computing : Parallel virtual machine (pvm) and message passing interface (mpi) libraries and calls. Advanced architectures. Today's fastest computers.

Mobile Computing : Mobile connectivity - Cells, Framework, wireless delivery technology and switching methods, mobile information access devices, mobile data internetworking standards, cellular data communication protocols, mobile computing applications. Mobile databases – protocols, scope, tools and technology. M-business.

E-Technologies : *Electronic Commerce.* Framework, Media Convergence of Applications, Consumer Applications, Organisation Applications. *Electronic Payment Systems.* Digital Token, Smart Cards, Credit Cards, Risks in Electronic Payment System, Designing Electronic Payment Systems.

Electronic Data Interchange (EDI). Concepts, Applications, (Legal, Security and Privacy) issues, EDI and Electronic Commerce, Standardisation and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Internet-Based EDI.

Digital Libraries and Data Warehousing. Concepts, Types of Digital documents, Issues behind document. Infrastructure, Corporate Data Warehouses.

Software Agents. Characteristics and Properties of Agents, Technology behind Software Agents (Applets, Browsers and Software Agents).

Broadband Telecommunications. Concepts, Frame Relay, Cell Relay, Switched Multi-megabit Data Service, Asynchronous Transfer Mode.

Main concepts in Geographical Information System (GIS), E-cash, E-Business, ERP packages.

Data Warehousing. Data Warehouse environment architecture of a data warehouse methodology, analysis, design, construction and administration.

Data Mining. Extracting models and patterns from large database, data mining techniques, classification, regression, clustering, summarisation, dependency modelling, link analysis, sequencing analysis, mining scientific and business data.

Windows Programming. Introduction to Windows programming - Win 32, Microsoft Foundation Classes (MFC), Documents and views, Resources, Message handling in windows.

Simple Applications (in windows). Scrolling, splitting views, docking toolbars, status bars, common dialogs.

Advanced Windows Programming. Multiple Document Interface (MDI), Multithreading, Object Linking and Embedding (OLE). Active X controls, Active Template Library (ATL). Network programming.

PAPER-III **(CORE Group)**

Unit-I : Combinational Circuit Design, Sequential Circuit Design, Hardwired and Micro-programmed processor design, Instruction formats. Addressing modes, Memory types and organisation, Interfacing peripheral devices, Interrupts.

Microprocessor architecture, Instruction set and Programming (8085, P-III/P-IV), Micro-processor applications.

Unit-II : Database Concepts, ER diagram, Data Models, Design of Relational Database, Normalisation, SQL and QBE, Query Processing and Optimisation, Centralised and Distributed Database, Security, Concurrency and Recovery in Centralised and Distributed Database Systems, Object Oriented Database Management Systems (Concepts, Composite objects, Integration with RDBMS applications), ORACLE.

Unit-III : Display systems, Input devices, 2D Geometry, Graphic operations, 3D Graphics, Animation, Graphic standard, Applications. Concepts, Storage Devices, Input Tools, Authoring Tools, Application, Files.

Unit-IV : Programming language concepts, paradigms and models. Data, Data types, Operators, Expressions, Assignment. Flow of control–control structures, I/O statements, User-defined and built-in functions, Parameter passing.

Principles, classes, inheritance, class hierarchies, polymorphism, dynamic binding, reference semantics and their implementation. Principles, functions, lists, types and polymorphisms, higher order functions, lazy evaluation, equations and pattern matching. Principles, horn clauses and their execution, logical variables, relations, data structures, controlling the search order, program development in prolog, implementation of prolog, example programs in prolog.

Principles of parallelism, coroutines, communication and execution. Parallel Virtual Machine (PVM) and Message Passing Interface (MPI) routines and calls. Parallel programs in PVM paradigm as well as MPI paradigm for simple problems like matrix multiplication.

Preconditions, post-conditions, axiomatic approach for semantics, correctness, denotational semantics.

Compiler structure, compiler construction tools, compilation phases. Finite Automata, Pushdown Automata. Non-determinism and NPA, DPDA and PDAs and languages accepted by these structures. Grammars, languages-types of grammars-type 0, type 1, type 2 and type 3. The relationship between types of grammars and finite machines. Pushdown automata and Context Free Grammars, Lexical Analysis – regular expressions and regular languages. LEX package on Unix Conversion of NFA to DFA. Minimising the number of states in a DFA. Compilation and Interpretation. Bootstrap compilers.

Context free grammars. Parsing and parse trees. Representation of parse (derivation) trees as rightmost and leftmost derivations. Bottom up parsers - shift-reduce, operator precedence and LR. YACC package on Unix system. Topdown parses-left recursion and its removal .Recursive descent parser. Predictive parser, Intermediate codes – Quadruples, triples, intermediate code generation, code generation, code optimization.

Unit-V : Analog and Digital transmission, Asynchronous and Synchronous transmission, Transmission media, Multiplexing and Concentration, Switching techniques, Polling.

Topologies, Networking Devices, OSI Reference Model, Protocols for - (i) Data link layer, (ii) Network layer and (iii) Transport layer, TCP/IP protocols, Networks security. Network administration.

Unit-VI : Definition, Simple and Composite structures, Arrays, Lists, Stacks queues, Priority queues, Binary trees, B-trees, Graphs.

Sorting and searching Algorithms, Analysis of Algorithms, Interpolation and Binary Search, Asymptotic notations – big ohm; omega and theta. Average case analysis of simple programs like finding of a maximum of n elements. Recursion and its systematic removal. Quicksort–non-recursive imple-mentation with minimal stack storage. Design of Algorithms (Divide and Conquer, Greedy method, Dynamic programming, Back tracking, Branch and Bound). Lower bound theory, Non-deterministic algorithm-Non-deterministic programming constructs. Simple non-deterministic programs. NP-hard and NP-complete problems.

Unit-VII : Object, messages, classes, encapsulation, inheritance, polymorphism, aggregation, abstract classes, generalization as extension and restriction. Object oriented design. Multiple inheritance, metadata.

HTML, DHTML, XML, Scripting, Java, Servelets, Applets.

Unit-VIII : Software development models, Requirement analysis and specifications, Software design, Programming techniques and tools, Software validation and quality assurance techniques, Software maintenance and advanced concepts, Software management.

Unit-IX : Introduction, Memory management, Support for concurrent process, Scheduling, System deadlock, Multiprogramming system, I/O management, distributed operating systems, Study of Unix and Windows NT.

Unit-X : Definitions, AI approach for solving problems. Automated Reasoning with propositional logic and predicate logic-fundamental proof procedure, refutation, resolution, refinements to resolution (ordering/pruning/restriction strategies).

State space representation of problems, bounding functions, breadth first, depth first, A, A & AO*, etc. performance comparison of various search techniques.

Frames, scripts, semantic nets, production systems, procedural representations. Prolog programming.

Components of an expert system, knowledge representation and Acquisition techniques, Building expert system and Shell.

RTNs, ATNs, Parsing of Ambiguous CFGs. Tree Adjoining Grammars (TAGs). Systems approach to planning, Designing, Development. Implementation and Evaluation of MIS.

Decision-making processes, evaluation DSS, group decision support System and case studies, Adaptive design approach to DSS development, Cognitive style in DSS, Integrating expert and decision support systems.

PAPER-III (Electives)

Elective-I : Theory of Computation. Formal language, Need for formal computational models, Non-computational problems, diagonal argument and Russel's paradox.

Deterministic Finite Automation (DFA), Non-deterministic Finite Automation (NFA), Regular languages and regular sets, Equivalence of DFA and NFA. Minimising the number of states of a DFA. Non-regular languages and Pumping lemma.

Pushdown Automation (PDA), Deterministic Pushdown Automation (DPDA), Non-equivalence of PDA and DPDA.

Context free Grammars. Greibach Normal Form (GNF) and Chomsky Normal Form (GNF), Ambiguity, Parse Tree Representation to Derivations. Equivalence of PDA's and CFG's. Parsing techniques for parsing of general CFG's – Early's, Cook-Kassami-Younger (CKY) and Tomita's parsing.

Linear Bounded Automata (LBA). Power of LBA. Closure properties.

Turing Machine (TM). One type, multitape. The notions of time and space complexity in terms of TM. Construction of TM of simple problems. Computational complexity.

Chomsky Hierarchy of Languages. Recursive and recursively-enumerable languages.

Elective-II : Models for Information Channel: Discrete Memoryless Channel, Binary Symmetric Channel (BSC), Burst Channel, Bit-error rates, Probability, Entropy and Shannon's measure of information. Mutual information. Channel capacity theorem. Rate and optimality of Information transmission.

Variable length Codes: Prefix Codes. Huffman Codes, Lempel Ziew (LZ) Codes. Optimality of these codes, Information content of these codes.

Error Correcting and detecting Codes. Finite fields. Hamming distance, Bounds of codes, Linear (Parity Check) codes, Parity check matrix, Generatory matrix, Decoding of linear codes, Hamming codes. *Image Processing.* Image registration, Spatial Fourier Transforms, Discrete Spatial (2D dimensional) Fourier Transforms, Restoration, Lossy Compression of images (pictures).

Data Compression Techniques. Representation and compression of text, sound, picture and video files (based on the JPEG and MPEG standards).

Elective-III : Linear Programming Problem (LPP) in the standard form, LPP in Canonical form. Conversion of LPP in Standard form to LPP in Canonical form. Simplex – Prevention of cyclic computations in Simplex and Tableau, Big-M method, dual simplex and revised simplex.

Complexity of simplex algorithms.

Exponential behaviour of simplex.

Ellipsoid method and Karmarkar's method for solving LPPs. Solving simple LPPs through these methods. Comparison of complexity of these methods.

Assignment and Transportation Problems. Simple algorithms like Hungarian method, etc.

Shortest Path Problems. Dijkstra's and Moore's method. Complexity.

Network Flow Problem. Formulation. Max-Flow Min-Cut theorem. Ford and Fulkerson's algorithm. Exponential behaviour of Ford and Fulkerson's algorithm. Malhotra-Pramodkumar-Maheshwari (MPM) Polynomial algorithm for solving Network flow problem. Bipartite Graphs and Matchings: Solving matching problems using Network flow problems.

Matroids: Definition. Graphic and Co-graphic matroids. Matroid intersection problem.

Non-linear Programming. Kuhn-Tucker conditions. Convex functions and Convex regions. Convex programming problems. Algorithms for solving convex programming problems-Rate of convergence of iterative methods for solving these problems.

Elective-IV : Neural Networks. Perception model, Linear separability and XOR problem. Two and three layered neural nets, Back propagation-Convergence, Hopfield nets, Neural net learning. Applications.

Fuzzy Systems. Definition of a Fuzzy set, Fuzzy relations, Fuzzy set, Fuzzy relations, Fuzzy functions, Fuzzy measures, Fuzzy reasoning, Applications of Fuzzy systems.

Elective-V : Unix. Operating System, Structure of Unix Operating System, Unix commands, Interfacing with Unix, Editors and Compilers for Unix. LEX and YACC, File system, System calls, Filters, Shell programming.

Windows. Windows environment, Unicode, Documents and Views. Drawing in a windows, Message handling, Scrolling and Splitting views, Docking toolbars and Status bars, Common dialogs and Controls, MDI, Multithreading, OLE, Active X controls, ATL, Database access, Network programming.

U.G.C. NET Exam. June, 2012

COMPUTER SCIENCE

(Solved with Explanation Paper-II)

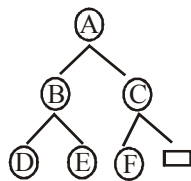
1. The postfix expression $AB + CD - *$ can be evaluated using a
- (a) Stack (b) Tree
(c) Queue (d) Linked list

Ans. (a) : Postfix expression can be evaluated using operand stack.

2. The post order traversal of a binary tree is **DEBFCA**. Find out the preorder traversal.
- (a) ABFCDE (b) ADBFEC
(c) ABDECF (d) None of the above

Ans. (c) ABDECF – Because

By post order traversal, we cannot draw unique binary tree even with preorder and post order cannot define unique binary tree.



⇒ After considering this chart or binary tree, the entire traversal of the tree would be ABDECF. So the answer is option c.

Type	First	Second	Third
in order	L-Left	R ₀ -Root	R-Right
pre order	R ₀ -Root	L-Left	R-Right
post order	L-Left	R-Right	R ₀ -Root

3. The branch logic that provides making capabilities in the control unit is known as
- (a) Controlled transfer
(b) Conditional transfer
(c) Unconditional transfer
(d) None of the above

Ans. (a) : Controlled transfer—that provides making capabilities in the control unit is known as control transfer.

4. The number of colours required to properly colour the vertices of every planar graph is
- (a) 2 (b) 3
(c) 4 (d) 5

Ans. (a) : According to the 4-color theorem states that the vertices of every planar graph can be colored with at most 4 colors so that no two adjacent vertices receive the same color.

5. Networks that use different technologies can be connected by using
- (a) Packets (b) Switches
(c) Bridges (d) Routers

Ans. (d): Routers—is a networking device that forwards data packets between computer networks. Router performs the traffic directing functions on the internet. A data packet is typically forwarded from one router to another through the networks that constitute their internetwork until it reaches its destination node. Router works at layer 3 of OSI model.

6. Both hosts and routers are TCP/IP protocol software. However, routers do not use protocol from all layers. The layer for which protocol software is not needed by a router is
- (a) Layer-5 (Application)
(b) Layer-1 (Physical)
(c) Layer-3 (Internet)
(d) Layer-2 (Network Interface)

Ans. (a) : Layer-5 (Application)—Because Routing is a way to get one packet from one destination to the next. So (Application) layer-5 includes all the higher protocols. So the answer is Layer-5 (Application)

7. In multiuser database if two users wish to update the same record at the same time, they are prevented from doing so by
- (a) Jamming (b) Password
(c) Documentation (d) Record lock

Ans. (d): Record lock—is the technique of preventing simultaneous access to data in a database, to prevent inconsistent results. If a collision is occur, both of the senders will send a jamming signal over the Ethernet.

8. A binary search tree is a binary tree
- (a) All items in the left subtree are less than root
(b) All items in the right subtree are greater than or equal to the root
(c) Each subtree is itself a binary search tree
(d) All of the above

Ans. (d) : All of the above—The above mentioned properties are mentioned in book of Data Structures (DS). According to summary on binary search trees the following properties are

- ⇒ All items in the left subtree are less than root.
- ⇒ All items in the right subtree are greater than or equal to root.
- ⇒ Each subtree is itself a binary search tree (BST).

So the correct answer would be (d).

9. What deletes the entire file except the file structure?

- (a) ERASE (b) DELETE
(c) ZAP (d) PACK

Ans. (C) : ZAP—Because ZAP Command removes all records from a table, leaving just a table structure. ERASE command deletes a file from disk.

10. Which command is the fastest among the following?

- (a) COPY TO <NEW FILE>
(b) COPY STRUCTURE TO <NEW FILE>
(c) COPY FILE <FILE 1> <FILE 2>
(d) COPY TO MFILE-DAT DELIMITED

Ans. (b) : Copy structure to <new file> is just copying the structure only.

11. B + tree are preferred to binary tree in Database because

- (a) Disk capacity are greater than memory capacities
(b) Disk access is much slower than memory access
(c) Disk data transfer rates are much less than memory data transfer rate
(d) Disks are more reliable than memory

Ans. (b) : Disk access is much slower than memory access. The major advantage of B⁺ tree is in reducing the number of last level access which would be from disk in case of large data size, so B⁺ tree preferred option (b).

12. A Transaction Manager is which of the following?

- (a) Maintains a log of transactions
(b) Maintains before and after database images
(c) Maintains appropriate concurrency control
(d) All of the above

Ans. (d) : All of the above

Because transaction manager performs all the operation mentioned in option A, B & C. So the answer is option (d).

13. Leaves of which of the following trees are at the same level?

- (a) Binary tree (b) B–tree
(c) AVL–tree (d) Expression tree

Ans. (b) : A B–tree is a tree data structure in which each node has at most two children, which one referred as left child and the right child.

According to Knuth's definition, a B-tree of order m is a tree which satisfies the following properties:

Every node has at most m children

Every non-leaf node has at least m/2 children

The root has at least two children if it is not leaf node.

A non-leaf node with k children contains (k-1) keys. All leaves appear in the same level.

It cannot be guaranteed in binary tree, AVL tree and expression tree.

14. Which of the following TCP/IP Internet protocol is diskless machine uses to obtain its IP address from a server?

- (a) RAP (b) RIP
(c) ARP (d) X. 25

Ans. (c) : Because, ARP (Address Resolution Protocol) is a protocol in TCP/IP protocol suite. This protocol is used for Basic TCP/IP Operations. ARP is used to find the Ethernet (H/W) address from a specific IP number.

15. Decryption and encryption of data are the responsibility of which of the following layer?

- (a) Physical layer (b) Data Link layer
(c) Presentation layer (d) Session layer

Ans. (c) : Service by Presentation layer:

Data conversion

Character code translation

Compression

Encryption and decryption

16. In which circuit switching, delivery of data is delayed because data must be stored and retrieved from RAM?

- (a) Space division (b) Time division
(c) Virtual (d) packet

Ans. (b) : Time division

Because, Time division multiplexing (TDM) is a method of transmitting and receiving independent signals over a common signal Path by means of synchronized switches at each end of the transmission line so that each signal appears on the line only a fraction of time in alternating pattern.

17. In which Routing Method do all the routers have a common database?

- (a) Distance vector (b) Link state
(c) Link vector (d) Dijkstra method

Ans. (b) : Link state necessary database require more memory than a distance vector requires.

Link state, the complex algorithm requires more CPU time than a distance vector protocol requires.

The flooding of link state packets adversely affects available bandwidth, particularly in unstable internetworks.

18. Page Shift Keying (PSK) Method is used to modulate digital signal at 9600 bps using 16 level. Find the line signals and speed (i.e. Modulation rate).

- (a) 2400 bauds (b) 1200 bauds
(c) 4800 bauds (d) 9600 bauds

Ans. (a) : 2400 bauds		
Modulation	Baud rate	Bit rate
4 – PSK	N	2N
8 – PSK	N	3N
16 – PSK	N	4N

Because, two values are provided, one is bps which is nothing but bits per second which is 9600 and also level which is 16. According to table given above for a 16–PSK give a baud rate N. the bit rate would be 4N. Here bps is provides which is 9600. In order to calculate the baud rate we have to divide bs/4. Because the signal level is 16. So the answer would be $9600/4 = 2400$ baud.

19. The station to hub distance in which it is 2000 metres.

- (a) 100 Base-Tx (b) 100 Base-Fx
(c) 100 Base-T₄ (d) 100 Base-T₁

Ans. (b) : 100 Base-Fx

Fast Ethernet is referred by 100 Base-x standard has three specification. Here 100 refers to the speed.

1. 100 Base T4
2. 100 Base Tx
3. 100 Base Fx

⇒ 100 Base Fx uses the 2-standard fibre optic cable and the station to hub distance is 2000 meters.

20. Main aim of software engineering is to produce

- (a) Program
(b) Software
(c) Within budget
(d) Software within budget in the given schedule

Ans. (d) : Because every software would be produce within the specific budget and in the specific time.

21. Key process areas of CMM level 4 are also classified by a process which is

- (a) CMM level 2 (b) CMM level 3
(c) CMM level 5 (d) All of the above

Ans. (c) : CMM level 5

Because, In CMM Model there are five maturity levels is identified by the number 1 to 5. They are–

(1) Initial, (2) Managed, (3) Defined, (4) Quantitatively Managed, (5) Optimizing

If a organisation is at level 2. It means it has crossed over level 1 and the same holds true and subsequent levels. At level 4, the process at level 3 is also included. CMM Level 5 is not correct because the question only talks about level 4. CMM level 2 is not correct because level 3 includes level & as well. So option (c) is correct.

22. Validation means

- (a) Are we building the product right
(b) Are we building the right product
(c) Verification of fields
(d) None of the above

Ans. (b) : Are we building the right product

Because validation means "are we building the right product" and verification means "are we building the product right".

23. If a process is under statistical control, then it is

- (a) Maintainable (b) Measurable
(c) Predictable (d) Verifiable

Ans. (c) : Predictable is a real valued stochastic process whose values are known in a sense, just in advance of time. Because, predictable process is also said to be under statistical control.

24. In a function oriented design, we

- (a) Minimize cohesion and maximize coupling
(b) Maximize cohesion and minimize coupling
(c) Maximize cohesion and maximize coupling
(d) Minimize cohesion and minimize coupling

Ans. (b) : Maximize cohesion and minimize coupling.

Because, the design purpose is to making coupling minimize and maximize the cohesion. Cohesion is a way to understand that how close or bound your module is, and coupling is the level of interactivity between modules for a good design to happen. Cohesion should be more and coupling should be less.

25. Which of the following metric does not depend on the programming language used?

- (a) Line of code (b) Function count
(c) Member of token (d) All of the above

Ans. (b) : Function count.

Because function count does not depend on programming language. Function count are a unit of measure a software just like a unit of measure for temperature would be degree.

26. A/B + tree index is to be built on the name attribute of the relation STUDENT, Assume that all students names are of length 8 bytes, disk block are of size 512 bytes and index pointers are of size 4 bytes. Given this scenario what would be the best choice of the degree (i.e. number of pointers per node) of the B + tree?

- (a) 16 (b) 42
(c) 43 (d) 44

Ans. (c) : (43)

Because, Now we see how it comes,

Let n be the degree

given, key size (length of the name attribute of student) = 8 bytes (k), index pointer size = 4 bytes (b)

Disk Block Size = 512 bytes

Degree of B+ tree can be calculated if we know the maximum number of key a internal node can have. The formula is,

$$\Rightarrow (n-1)k + n * b = \text{block size}$$

$$\Rightarrow (n-1) * 8 + n * 4 = 512$$

$$\Rightarrow 8n - 8 - 4n = 512$$

$$\Rightarrow 12 = 520$$

$$\Rightarrow n = 520/12 = 43 \quad (\text{Option c})$$

27. The In order traversal of the tree will yield a sorted listing of elements of tree in

- (a) Binary tree (b) Binary search tree
(c) Heaps (d) None of the above

Ans. (b) : Binary search tree

Because, In BST all elements to the root of the tree will be lesser than the root. Also elements greater than the root will be right of the root, so the answer is Option (b)

28. Mobile IP provides two basic functions

- (a) Route discovery and registration
(b) Agent discovery and registration
(c) IP binding and registration
(d) None of the above

Ans. (b) : Agent discovery and registration

Because, Mobile IP is the basic behind how wireless devices offer IP connectivity.

Agent discovery: A mobile node discovers its foreign and home agents during discovery.

Registration: the mobile node registers its current location with the foreign agent and home agent during registration. Are two basic functions involved here, so the option is (b).

29. Pre-emptive scheduling is the strategy of temporarily suspending a running process

- (a) Before the CPU time slice expires
(b) To allow starving processes to run
(c) When it requests I/O
(d) To avoid collision

Ans. (a) : Before the CPU time slice expires

Because, Every process is allocated a specific time slice in the CPU and it runs for that entire time. In pre-emptive scheduling even before the process time slice expires. It is temporarily suspended from its execution. So the option is (a).

30. In round robin CPU scheduling as time quantum is increased the average turn around time

- (a) Increases (b) Decreases
(c) Remains constant (d) Varies irregularly

Ans. (d) : Varies irregularly

Because, \Rightarrow **Turn around time** is the interval of time between the submission of a process and its completion.

\Rightarrow **Wait time** is the amount of time a process has been waiting in the ready queue

\Rightarrow **Response time** is the time taken between the process submission and the first response produced.

In RR algorithm, value of time slice, plays a crucial role in deciding how effective the algorithm is. If quantum time is too small then it could be like context switching and if quantum time is high, the RR behaves like FCFS, the average response time varies irregularly. So the answer is option (d).

31. Resources are allocation to the process non-share below basis is :

- (a) Mutual exclusion (b) Hold and wait
(c) No pre-emption (d) Circular wait

Ans. (a) : Mutual exclusion is a program object that prevents simultaneous access to a shared resource. This concept is used in concurrent programming with a critical section, a piece of code in which processes or threads access a shared resource.

32. Cache and interleaved memories are ways of speeding up memory access between CPU and slower RAM. Which memory models are best suited (i.e. Improves the performance mostly which program)

- (1) Cached memory is best suited for small loops.
(2) Interleaved memory is best suited for small loops
(3) Interleaved memory is best suited for large sequential code.
(4) Cached memory is best suited for large sequential code.
(a) 1 and 2 are true (b) 1 and 3 are true
(c) 4 and 2 are true (d) 4 and 3 are true

Ans. (b) : Interleaved memory is best suited for small 100 ps.

Because, Here multiple memory chips are grouped together to form what we are known as banks. Each of them take turns for supplying data. An interleaved memory with " n " banks is said to be n -way interleaved. Macintosh system are considered to be one using memory interleaving.

33. Consider the following page trace : 4, 3, 2, 1, 4, 3, 2, 1, 5 Percentage of page fault that would occur if FIFO page replacement algorithm is used with number of frame for JOB $m = 4$ will be :

- (a) 8 (b) 9
(c) 10 (d) 12

Ans. (c) : 10

Because, reference string is 4, 3, 2, 1, 4, 3, 2, 1, 5
number of frames $m = 4$

⇒ First 4 references (4, 3, 2, 1) cause page faults and brought into empty frames

⇒ next reference (4) is already available and so there is no page fault

⇒ next reference (3) is also ready available and so there is no page fault

⇒ the next reference (5) replaces page 4 which was brought the first no. of page fault = 5

⇒ next reference (4) replace page 3 which is the next to come in no. of page faults = 6

⇒ next reference (3) replaces 2 no. of page faults till now = 7

⇒ next reference (2) replaces 1 a which was to last pages to come in no. of page fault till now = 8

⇒ next reference (1) replaces 5 which as the first to come in the second cycle no. of page faults till now = 9

⇒ the last reference in the reference string is 5 which will replace 4 no. of page faults till now = 10

⇒ the page faults are the 10 so the answer is option (c).

34. Check sum used along with each packet computes the sum of the data, where data is treated as a sequence of

- (a) Integer (b) Character
(c) Real numbers (d) Bits

Ans. (b) : Character

Because, check sum is the error detecting mechanism when data is treated as a sequence of character. parity is a mechanism used when data is treated as a sequence of bits.

35. If an integer needs two bytes of storage, then the maximum value of a signed integer is

- (a) $2^{16} - 1$ (b) $2^{15} - 1$
(c) 2^{16} (d) 2^{15}

Ans. (b) : $2^{15} - 1$

In case of magnitude Representation the Range is from $(2^{n-1}-1)$ to $(2^{n-1}-1)$

Min no. that can be represent in this system is $-(2^{n-1}-1)$

Max no. that can be represent in this system is $(2^{n-1}-1)$

In case 2's complement no. system the range is -2^{n-1} to $2^{n-1}-1$

Max no. that can be represent in this system $2^{n-1}-1$

So, Max no. can be represented here which $2^{n-1}-1$ is $2^{16}-1 \rightarrow 2^{15}-1$

36. Which of the following logic families is well suited for high-speed operations?

- (a) TTI (b) ECL
(c) MOS (d) CMOS

Ans. (b) : ECL

Because, ECL (Emitter coupled logic) is a high speed integrated circuit bipolar transistor logic family.

37. Interrupts which are initiated by an instruction are

- (a) Internal (b) External
(c) Hardware (d) Software

Ans. (c) : Hardware

Interrupts are of three types—(1) External interrupts, (2) Internal interrupts, (3) Software interrupts.

Hardware interrupts are used by devices to communicate that they require attention from the operating system.

38. `printf("%c" 100)`

- (a) Prints 100
(b) Prints ASCII equivalent of 100
(c) Prints garbage
(d) None of the above

Ans. (b) : Prints ASCII equivalent of 100

Because the %c format prints the ASCII equivalent of the value.

39. For the transmission of the signal, Bluetooth wireless technology uses

- (a) Time division multiplexing
(b) Frequency division multiplexing
(c) Time division duplex
(d) Frequency division duplex

Ans. (c) : Time division duplex is the application of time division multiplexing to separate outward and return signals.

Here Bluetooth technology uses time division duplex transmission duplex.

40. Consider the following statements

- a. Recursive languages are closed under complementation.
b. Recursively enumerable languages are closed under union.
c. Recursively enumerable languages are closed under complementation.

Which of the above statements are true?

- (a) 1 only (b) 1 and 2
(c) 1 and 3 (d) 2 and 3

Ans. (b) : 1 and 2

Because, recursive languages are closed under the following operations—

(1) Keene star, (2) concatenation, (3) union, (4) intersection, (5) complement, (6) set difference

Recursively enumerable languages are enclosed under the following operation.

(1) Keene star, (2) concatenation, (3) union, (4) intersection

Recursively enumerable languages are not closed under compliment, so the statement (1) and (2) are only true.

41. What is the routing algorithm used by RIP and IGRP?

- (a) OSPF
- (b) Link-state
- (c) Dynamic
- (d) Dijkstra vector

Ans. (d) : Dijkstra vector

Because, RIP (Routing information Protocol) and IGRP (interior Gateway Routing Protocol) are the example of distance Vector Routing Protocol and open shortest path (OSPF) is an example of Link State Routing Protocols. Distance vector algorithms are based on Belma and ford algorithm. Link State Routing Protocols is based on Dijkstra algorithm. So the options are OSPF, link state, dynamic are ruled out. So the answer is option (d).

42. Identify the incorrect statement

- (a) The overall strategy drives the E-Commerce data warehousing strategy.
- (b) Data warehousing in an E-Commerce environment should be done in a classical manner.
- (c) E-Commerce opens up an entirely new world of web server.
- (d) E-Commerce security threats can be grouped into three major categories.

Ans. (d) : The threat environment for E-Commerce data warehousing application, security threats can be grouped into three major categories.

Loss of data secrecy

Loss of data integrity

Loss of denial of service

Because, E-commerce security threats are more than 3 in number and so the incorrect statement is d.

43. Reliability of software is directly dependent on

- (a) Quality of the design
- (b) Number of errors present
- (c) Software engineers experience
- (d) User requirement

Ans. (b) : Software reliability is measured in term of Mean time between failures. Reliability of software is number between 0 and 1. Reliability increases when errors or bugs from the program are removed, so the option is b.

44. is not an E-Commerce application.

- (a) House banking
- (b) Buying stocks
- (c) Conducting an auction
- (d) Evaluating an employee

Ans. (d) : Evaluating an employee is not an E-commerce application.

45. is a satellite based tracking system that enables the determination of person's position.

- (a) Bluetooth
- (b) WAP
- (c) Short Message Service
- (d) Global Positioning System

Ans. (d) : Global Positioning System is a satellite based navigation system.

46. A complete microcomputer system consists of

- (a) Microprocessor
- (b) Memory
- (c) Peripheral equipment
- (d) All of the above

Ans. (d) : All of the above

Because, In complete microcomputer system there is a Microprocessor or and a memory part as well and there is peripheral equipment part is also there, so the correct option is (d).

47. Where does a computer add and compare data?

- (a) Hard disk
- (b) Floppy disk
- (c) CUP chip
- (d) Memory chip

Ans. (c) : CUP chip

Because, Hard disk, Floppy disk, Memory chip are the storage devices so these are ruled out and now the correct option is (c).

48. Pipelining strategy is called implement

- (a) Instruction execution
- (b) Instruction prefetch
- (c) Instruction decoding
- (d) Instruction manipulation

Ans. (b) : Instruction prefetch is often combined with pipelining in an attempt to keep the pipeline busy. So the option is (b).

49. Which of the following data structure is linear type?

- (a) Strings
- (b) Lists
- (c) Queues
- (d) All of the above

Ans. (d) : All of the above

Because, strings, Link lists and queues are linear type data structure because the data of these option were arranged or organized in sequential or linearly, where data elements attached one after another.

50. To represent hierarchical relationship between elements, which data structure is suitable?

- (a) Dequeue
- (b) Priority
- (c) Tree
- (d) All of the above

Ans. (c) : A Tree structure is a way of representing the hierarchical nature of a structure in a graphical form. so the answer is option (c).

U.G.C. NET Exam. June, 2012

COMPUTER SCIENCE

(Solved with Explanation Paper-III)

1. Consider the following pseudo code segment:
K: = 0 for i1: = 1 to n for i2 : = 1 to i1 : For im: =1to im – 1 **K: = K + 1** The value of K after the execution of this code shall be

- (a) $C(n + m - 1, m)$
- (b) $C(n - m + 1, m)$
- (c) $C(n + m - 1, n)$
- (d) $C(n - 1 + 1, n)$

Ans. (a) : $C(n + m - 1, m)$

Because, In order to understand the solution to this problem let us consider some sample value of n and m. Let us say $n = 3$ and $m = 2$. The value of m also decides the number of inner loop we have. When we say $m = 2$, the total number of loops we have is 2 only n decides the range of outer most loop, so the pseudocode can be under stood as

```
k = 0
for i = 1 to n
  for m = 1 to i
    k = k + 1
```

⇒ For the value of $n = 3$ and $m = 2$, the value of k would be incriminated in following manner

i	m	k
1	1	1
2	1	2
2	2	3
3	1	4
3	2	5
3	3	6

⇒ Value of i ranges & rom 1 to n where $n = 3$

⇒ Value ko k is $k = 6$ at the end of iteration $C(n + m - 1/m) = C(3 + 2 - 2) = C(4, 2) = 4!/2! * 2! = 6$.

⇒ So the answer is A

2. In Delta Rule for error minimization
- (a) Weights are adjusted w.r. To change in the output
 - (b) Weights are adjusted w.r. To difference between desired output and actual output
 - (c) Weights are adjusted w.r. To difference between input and output
 - (d) None of the above

Ans. (b) : in delta rule for error minimization, weights are adjusted with respect to difference between desired output and actual output.

3. The concept of pipelining is most effective in improving performance if the tasks being performed in different stages:

- (a) require different amount of time
- (b) require about the same amount of time
- (c) require different amount of time with time difference between any two tasks being same
- (d) require different amount with time difference between any two tasks being different

Ans. (b) : Require about the same amount of time.

Because, Pipe lining is a technique to build fast processors it allows the execution of multiple instruction by overlapping them. Pipe lining can executes multiple instructions. So it requires the same amount of time. So that the answer is B.

4. What is Granularity?

- (a) The size of database
- (b) The size of data item
- (c) The size of record
- (d) The size of file

Ans. (b) : The size of data item is often called the data item granularity.

5. Suppose that given application is run on a 64-process or machine and that 70 percent of the application can be parallelized. Then the expected performance improvement using Amdahl's law is

- (a) 4.22
- (b) 3.22
- (c) 3.32
- (d) 3.52

Ans. (b) : 3.22

Because, According to Amdahl's law, in case of parallelization, if p is the proportion of the program that can be made parallel, then (1-p) is the proportion can be paralyzed. Then the maximum speedup that can be achieved by using N processor, $S(N) = 1/(1-P) + P/N$, where N refers the number of processor and P refers to the proportion that can be paralyzed.

6. If two fuzzy sets A and B are given with membership functions $\mu_A(x) = \{0.2, 0.4, 0.8, 0.5, 0.1\}$ $\mu_B(x) = \{0.1, 0.3, 0.6, 0.3, 0.2\}$ Then the value of $\mu_{A \cap B}$ will be

- (a) $\{0.9, 0.7, 0.4, 0.8, 0.9\}$
- (b) $\{0.2, 0.4, 0.8, 0.5, 0.2\}$
- (c) $\{0.1, 0.3, 0.6, 0.3, 0.1\}$
- (d) $\{0.7, 0.3, 0.4, 0.2, 0.7\}$

Ans. (a) :

Give two fuzzy set

$$\mu_{\bar{A}} = \{0, 2, 0.4, 0.8, 0.5, 0.1\}$$

$$\mu_{\bar{A}} = \{0.1, 0.3, 0.6, 0.3, 0.2\}$$

$$\text{so, } \mu_{\bar{A}} \cup_B(x) = \{0.2, 0.4, 0.8, 0.5, 0.2\}$$

and

$$\mu_{\bar{A}} \cup_B(x) = \{0.8, 0.6, 0.2, 0.5, 0.8\}$$

$$= 1 - \{0.1, 0.3, 0.6, 0.3, 0.1\}$$

$$= \{0.9, 0.7, 0.4, 0.7, 0.9\}$$

7. **Match the following:**

- | | |
|--------------------|-------------------|
| (a) OLAP | 1. Regression |
| (b) OLTP | 2. Data Warehouse |
| (c) Decision Tree | 3. RDBMS |
| (d) Neural Network | 4. Classification |
| (a) 2 3 1 4 | (b) 2 3 4 1 |
| (c) 3214 | (d) 3241 |

Ans. (b) : In OLTP database there is detailed and current data. In OLTP database schema used to store transaction data usually 3NF. OLAP is characterized by relatively low volume of transactions.

Decision tree is used for classification of data in data mining and AI.

Neural networks are used for the purpose of unsupervised learning, regression or classification.

8. **Which level of Abstraction describes what data are stored in the Database?**

- (a) Physical level
- (b) View level
- (c) Abstraction level
- (d) Logical level

Ans. (d) : Logical level

Because, Logical level describes what data are stored in the data base and what relationship among those data.

9. **The problem that occurs when one transaction updates a database item and then the transaction fails for some reason is**

- (a) Temporary Select Problem
- (b) Temporary Modify Problem
- (c) Dirty Read Problem
- (d) None

Ans (c) : The temporary (or dirty read) problem this problem occurs when one transaction updates a database item and then transaction fails for some reason. The updated item is accessed by another transaction before it is changed back to its original value.

10. **In an image compression system 16×3^4 bits are used to represent 256×256 image with 256 gray level. What is the compression ratio for this system?**

- (a) 1
- (b) 2
- (c) 4
- (d) 8

Ans. (*) number of bits required to store a 256×256 image with 256 gray level is

256 gray level is $= 2^8$

Therefore, compression ratio $= 256 \times 256 \times 8 / 16384 = 32$

11. **X.25 is Network.**

- (a) Connection Oriented Network
- (b) Connection less Network
- (c) Either Connection Oriented or Connection Less
- (d) Neither Connection Oriented nor Connection Less

Ans. (a) X.25 is an ITU-T standard protocol suite for packet switched Wide Area Network communication. NSAP addressing facility was added in the X.25 revision of the specification, and this enabled X.25 to better meet the requirements of OSI connection-Oriented Network service (CONS).

12. **Which of the following can be used for clustering of data?**

- (a) Single layer perception
- (b) Multilayer Perception
- (c) Self organizing map
- (d) Radial basis function

Ans. (c) : Self Organizing map is a type of Artificial Neural Network that is trained using unsupervised learning to produce a low dimensional maps. In maps consisting of thousands of nodes, it is possible to perform cluster operations on the map itself.

13. **Which of the following is scheme to deal with deadlock?**

- (a) Time out
- (b) Time in
- (c) Both A & (B)
- (d) None of the above

Ans. (a) : Time out

Because, One of the strategy to avoid dead lock situation in java multithreading is using timeout. Suppose, one thread has acquired lock on one resource and now waiting for lock on another resource. After certain time period if it can not acquire lock on resource and then it should stop waiting for lock on resource 2. Also it should release lock on resource 1. Thus lock is avoided, so the Answer is a

14. **If the pixels of an image are shuffled then the parameter that may change is**

- (a) Histogram
- (b) Mean
- (c) Entropy
- (d) Covariance

Ans. (d) : Covariance

Because, Covariance is a measure of how much two random variable change together. So when pixel of an image suffered then covariance is changed.

15. The common property of functional language and logical programming language

- (a) Both are declarative
- (b) both are based on λ -calculus
- (c) Both are procedural
- (d) Both are functional

Ans. (a) : Both are declarative

Functional and logical programming languages are characterized by declarative programming style. In logical programming languages, programs consist of logical statements and program executes by searching for proof of the statements.

16. Given the following statements:

- (1) The power of deterministic finite State machine and nondeterministic finite state machine are same
 - (2) The power of deterministic pushdown automaton and nondeterministic pushdown automaton are same
- Which of the above is the correct statement (s)?
- (a) Both 1 and 2
 - (b) Only 1
 - (c) Only 2
 - (d) Neither 1 nor 2

Ans. (b) : Only (1)

Because, we are now that finite machine is of two types one is deterministic finite state machine and the other one non deterministic finite state machine. Both machine accept regular language only, so the power of DFA = NFA, so the first statement is true.

There is no algorithm exist which convert NPDA into DPDA. So, power of NPDA is more than DPDA.

hence the answer is (b)

17. Let $Q(x, y)$ denote " $x + y = 0$ " and let there be two quantifications given as

- (i) $\exists y \forall x Q(x, y)$
 - (ii) $\forall x \exists y Q(x, y)$ which of the following is valid? where x & y are real numbers. Then
- (a) (i) is true & (ii) is false.
 - (b) (i) is false & (ii) is true.
 - (c) (i) is false & (ii) is also false.
 - (d) both (i) & (ii) are true.

Ans. (b)

$\exists y \forall x Q(x+y=0)$ is false

Since for all x single y not exist whose addition produce result 0.

i.e., $x+y=0$

$\forall x \exists y Q(x+y=0)$ is true

Because for every x then exist $y=-x$ whereas addition produce result as 0.

18. Consider a schema $R(A, B, C, D)$ and functional dependencies $A \rightarrow B$ and $C \rightarrow D$. Then the decomposition $R_1(A, B)$ and $R_2(C, D)$ is

- (a) Dependency preserving but not lossless join
- (b) Dependency preserving and lossless join
- (c) Lossless join but not dependency preserving
- (d) Lossless Join

Ans. (a) : Dependency preserving but not lossless join

Because, for lossless after decomposition of relation into if there is any common attribute in the decomposed relation and that attribute is key in any of relation then it is lossless.

Here no attribute are common R_1 and R_2

so this one is not lossless

For dependency from the dependencies of the spited schemas then it is dependency preserving

here from $R_1 \implies A \rightarrow B$ from $R_2 \implies C \rightarrow D$ can be divided so it is DP, then the answer is (a)

19. The quantiser in an image-compression system is a

- (a) lossy element which exploits the psycho visual redundancy
- (b) lossless element which exploits the psycho visual redundancy
- (c) lossy element which exploits the statistical redundancy
- (d) lossless element which exploits the statistical redundancy

Ans. (a) : Lossy element which exploits the psycho visual redundancy

Because, Quantization, involved in image processing is a lossy compression technique achieved by compressing a range of values to single quantum value. When the number of discrete symbols in a given stream is reduced and the stream becomes more compressible.

so the answer is a

20. Data Warehouse provides

- (a) Transaction Responsiveness
- (b) Storage. Functionality Responsiveness to queries
- (c) Demand and Supply Responsiveness
- (d) None of the above

Ans. (b) : Storage functionality responsiveness to queries

Because, data warehouses are supposed to provide storage functionality and responsiveness oriented databases. Also data warehouse are set to improve the data access performance of database.

21. A * algorithm $f = g + h$ to estimate the cost of getting from the initial state to the goal state, where g is a measure of the cost of getting from initial state to the current node and the function h is an estimate of the cost of getting from the current node to the goal state. To find a path involving the fewest number of steps, we should set

- (a) $g = 1$ (b) $g = 0$
(c) $h = 0$ (d) $h = 1$

Ans. (a) : $g = 1$

Because, a* algorithm is the most important form of best first search,

$F = g + h$

g is the measure of cost getting from initial to the current node and the function,

h is and estimate of the cost of getting from the current node to the goal state.

Now if want to find a path involving the first number of steps then we set the cost of going from a node to its successor (i.e. g) as a constant usually 1. hence the answer is a

22. The transform which possesses the highest 'energy compaction' property is

- (a) Slant transform
(b) Cosine transforms
(c) Fourier transforms
(d) Karhunen-Loeve transforms

Ans. (d) : Karhunen-Loeve transforms

Because, most of the signal information is concentrated in few low frequency components of the transform, so approaching the Karhunen-Loeve transforms, which is optimal in the decor relation sense.

23. Which one of the following prolog programs correctly implement "if G succeeds then execute goal P else execute goal θ ?"

- (a) if-else (G, P, θ) :- !, call (G), call (P).
if-else (G, P, θ) :- call (θ)
(b) if-else (G, P, θ) :- call (G), !, call (P).
if-else (G, P, θ) :-call (θ)
(c) if-else (G, P, θ) :- call (G), call (P), !.
if-else (G, P, θ) :- call (θ)
(d) All of the above

Ans. (b) : If G succeeds then execute goal P else execute goal θ :

If else (G, P, θ) : call (G), !, call (P)

If else (G, P, θ) : call (θ)

24. The memory allocation function modifies the previous allocated space.

- (a) cal loc () (b) free ()

- (c) malloc () (d) real loc ()

Ans. (d) : real loc ()

Because, mal loc and cal loc are used to allocate dynamic memory.

free is used to frees the allocated memory be cal loc and mal loc

Real loc is used to reallocated or modifies the previous allocated space, hence the answer is d

25. Which is not the correct statement (s)?

- (a) Every context sensitive language is recursive.
(b) There is a recursive language that is not context sensitive.
(i) 1 is true, 2 is false.
(ii) 1 is true and 2 is true.
(iii) 1 is false, 2 is false.
(iv) 1 is false and 2 is true.

Ans. (b) : Since context sensitive languages are subset of recursive languages.

Therefore, both statements are correct.

26. The mechanism that binds code and data together and keeps them secure from outside world is known as

- (a) Abstraction (b) Inheritance
(c) Encapsulation (d) Polymorphism

Ans. (c) : Encapsulation is an OOP concept that binds together the data and functions that manipulate the data and that keeps both safe from outside interference and misuse. Data encapsulation led to the important OOP concept of data hiding.

27. Identify the addressing modes of below instructions and match them:

- (a) ADI 1. Immediate addressing
(b) STA 2. Direct addressing
(c) CMA 3. Implied addressing
(d) SUB 4. Register addressing
(i) $a - 1, b - 2, c - 3, d - 4$
(ii) $a - 2, b - 1, c - 4, d - 3$
(iii) $a - 3, b - 2, c - 1, d - 4$
(iv) $a - 4, b - 3, c - 2, d - 1$

Ans. (a) : ADI. Immediate addressing

Because. the instruction ADI adds same content to the accumulator. It is an immediate addressing made instruction. The instruction STA stores the content of the accumulator in the particular memory location specified as operand, CMA takes complement of the contents of the accumulator. SUB instruction subtracts the content of the register to the contents of the accumulator.

Hence the answer is a

28. Which one of the following is not a Greibach Normal form grammar?

(a) $S \rightarrow a|bA|aA|bB$

$A \rightarrow a$

$B \rightarrow b$

(b) $S \rightarrow a|aA|AB$

$A \rightarrow a$

$B \rightarrow b$

(c) $S \rightarrow a|A|aA$

$A \rightarrow a$

(a) 1 and 2

(b) 1 and 3

(c) 2 and 3

(d) 1, 2 and 3

Ans. (c) : (2) and (3)

Because, the symbol on the right hand side of the production must be terminal. It can be followed by zero or more variables in grammar (2) of the question $S \rightarrow ABv$ is the production. AB are two non-terminals can be in GNF (Greibach Normal Form Grammar). In grammar not allowed in GNF. So the grammar which is not in GNF is (2) and (3) so the option is c

29. Which of the following IP address class is a multicast address?

(a) Class A

(b) Class B

(c) Class C

(d) Class D

Ans. (d) : IPv4 multicast addresses are defined by the leading address bits of 1110, originating from the class full network design of the early internet when this group of addresses was designated as Class D.

30. While unit testing a module, it is found that for a set of test data, maximum 90% of the code alone were tested with a probability of success 0.9. The reliability of the module is

(a) at least greater than 0.9

(b) equal to 0.9

(c) at most 0.81

(d) at least $1/0.81$

Ans. (c) : almost 0.81

Because, code tested maximum 90%

Probability of success is 0.9

so the reliability of module almost $0.9 \times 0.9 = 0.81$

hence the answer is option c

31. The upper bound computing time of m coloring decision problem is

(a) $O(nm)$

(b) $O(n^m)$

(c) $O(nmn)$

(d) $O(nmmn)$

Ans. (c) : $O(nmn)$

Because, the $O(nm^n)$ is the only bound of computing time of M coloring.

32. The equivalent grammar corresponding to the grammar

$G : S \rightarrow aA,$

$A \rightarrow BB,$

$B \rightarrow aBb| \epsilon$

is

(a) $S \rightarrow aA, A \rightarrow BB, B \rightarrow aBb$

(b) $S \rightarrow a|aA, A \rightarrow BB, B \rightarrow aBb|ab$

(c) $S \rightarrow a|aA, A \rightarrow BB|B, B \rightarrow aBb$

(d) $S \rightarrow a|aA, A \rightarrow BB|B, B \rightarrow aBb|ab$

Ans. (d) : Given grammar is :

$S \rightarrow aA$

$A \rightarrow BB$

$B \rightarrow aBb| \epsilon$

Removing null-production from the grammar :
Nullable variables are $\{A, B\}$, so,

$S \rightarrow a|aA$

$A \rightarrow B|BB$

$B \rightarrow aBb|ab$

33. Which one of the following statements is incorrect?

(a) The number of regions corresponds to the cyclomatic complexity.

(b) Cyclomatic complexity for a flow graph G is $V - E + 2$, where E is the number of edges and N is the number of nodes in the flow graph.

(c) Cyclomatic complexity for a flow graph G is $V - E + 2$, where E is the number of edges & N is the number of nodes in the flow graph.

(d) Cyclomatic complexity for a flow graph G is $VG = P + 1$, where P is the number of predicate nodes contained in the flow graph G.

Ans. (b) : Cyclomatic complexity is a software metric (measurement) used to indicate the complexity of a program. The complexity M is defined as :

$$M = E - N + 2P$$

where, E is the number of edges, N is number of vertices and P is number of connected component of flow graph. For a single program (component) P is always equal to 1.

Also, the number of regions corresponds to the cyclomatic complexity (M) and

$$M = P + 1$$

where P (nodes whereas out degree more than 1) is number of predicated notes contained in the flow graph G.

34. Consider a weighted undirected graph with positive edge weights and let (u, v) be an edge in the graph. It is known that the shortest path from source vertex s to u has weight 53 and

shortest path from s to v has weight 65. Which statement is always true?

- (a) Weight $(u, v) < 12$
- (b) Weight $(u, v) = 12$
- (c) Weight $(u, v) \geq 12$
- (d) Weight $(u, v) > 12$

Ans. (c) : Weight $(u, v) \geq 12$

Because, if weight $(u, v) < 12$ then the min. weight of $(s, u) = \text{weight of } (s, u) + \text{weight of } (u, v) = 53 + (< 12)$ will be less than 65 so that answer is c

35. Consider the regular expression $(a + b) \dots (a + b)$ (n -times). The minimum number of states in finite automaton that recognizes the language represented by this regular expression contains

- (a) n states
- (b) $n + 1$ states
- (c) $n + 2$ states
- (d) $2n$ states

Ans. (b) : $n + 1$ states

Because, without trap for 1 symbol $(a + b)$ or b , required 2 states and for 2 symbols $(a + b)$ required 3 states and so on so, $n + 1$ states for NFA
 $n + 2$ states for DFA (include trap state)
asking for minimum so $n + 1$ states

36. Number of binary trees formed with 5 nodes is

- (a) 32
- (b) 36
- (c) 120
- (d) 42

Ans. (d) : 42

Because, $C = \frac{2^n C_n}{n+1} = \frac{10 C_5}{6} = \frac{256}{6} = 42$

so the option is d

37. Are we building the right product? This statement refers to

- (a) Verification
- (b) Validation
- (c) Testing
- (d) Software quality assurance

Ans. (b) :

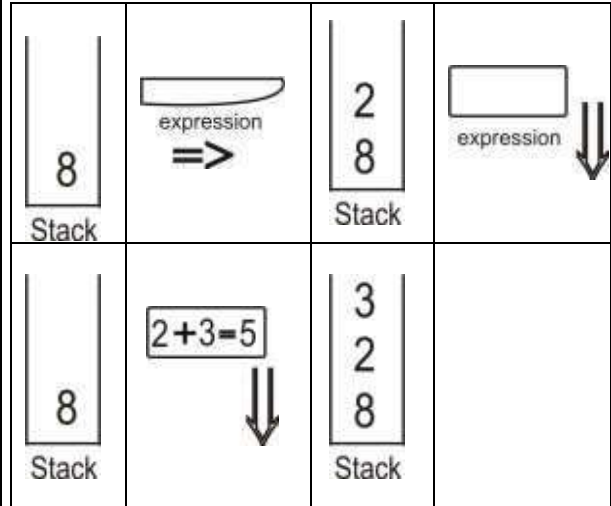
- Validation : Are we building the right product?
- Verification : Are we building the product right?

38. The following postfix expression is evaluated using a stack $823^{\wedge}/23 * + 51 * -$ The top two elements of the stack after first $*$ is evaluated

- (a) 6, 1
- (b) 5, 7
- (c) 3, 2
- (d) 1, 5

Ans. (a) : 6, 1

Because, hence the answer is a (6, 1)



39. The following CFG $S \rightarrow aB \mid bA$, $A \rightarrow a \mid as \mid bAA$, $B \rightarrow b \mid bs \mid aBB$ Generates strings of terminals that have

- (a) Odd number of a's and odd number of b's
- (b) Even number of a's and even number of b's
- (c) Equal number of a's and b's
- (d) Not equal number of a's and b's

Ans. (c) : Given CFG is :

$S \rightarrow aB \mid bA$

$A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid aBB$

The language of given CFG is set of all strings that have equal number of a's and b's. Other CFG may also possible for this language.

40. Consider the following pseudo-code: If $(A > B)$ and $(C > D)$ then

$A = A + 1$

$B = B + 1$

Endif

The cyclomatic complexity of the pseudo-code is

- (a) 2
- (b) 3
- (c) 4
- (d) 5

Ans. (b) : Cyclomatic complexity directly measures the number of linearly independent paths through a program's source code :

Given, if $(A > B)$ and $(C > D)$ then

$A = A + 1$

$B = B + 1$

end if

Case (i) :

if (true) and (true) then

//execute some code

end if

Case (ii) :

if (true) and (false) then

//don't execute code

end if

Case (iii) :

If (false) and (2nd part won't be executed) then
//don't execute code
end if
So cyclomatic complexity will be 3.

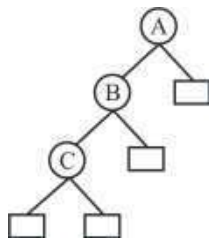
41. Which layer of OSI reference model uses the ICMP (Internet Control Message Protocol)?

- (a) Transport layer (b) Data link layer
(c) Network layer (d) Application layer

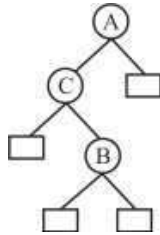
Ans. (c) : The internet Control Message Protocol (ICMP) is a network layer protocol that is used by network devices, like routers, to send error message and operational information indicating, for example, that a requested service is not available or that a host or router could not be reached.

42. Which one of the following binary search tree is optimal, if probabilities of successful search and unsuccessful search are same?

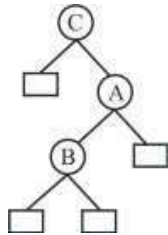
(a)



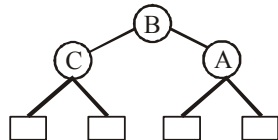
(b)



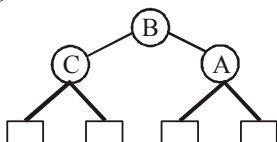
(c)



(d)

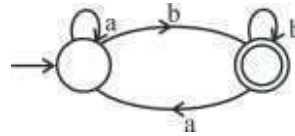


Ans. (d)



Given binary tree is balanced binary tree. So, it gives optimal.

43. The regular expression following DFA is



- (a) $ab^*(b + aa^*b)^*$
(b) $a^*b(b + aa^*b)^*$
(c) $a^*b(b^* + aa^*b)$
(d) $a^*b(b^* + aa^*b)^*$

Ans. (b, d) Regular expression is

$$L = a^*b(b + aa^*b)^*$$

$$= a^*b(b^* + aa^*b)^*$$

Both option (b) and (d) are true.

44. Which diagram provides a formal graphic notation for modelling objects, classes and their relationships to one another?

- (a) Object diagram (b) Class diagram
(c) Instance diagram (d) Analysis diagram

Ans. (a) Object diagram provide a formal graphic notation for modeling objects, classes and their relationship to another. Object diagrams are useful for both abstract modeling and for designing actual program.

45. A computer system supports 32 bit virtual address as well as 32 bit physical addresses. Since the virtual address space is of same size as that of physical address space, if we want to get rid of virtual memory, which one of the following is true?

- (a) Efficient implementation of multiuser support is no longer possible.
(b) The processor cache can be made more efficient.
(c) Hardware support for memory management is not needed.
(d) CPU scheduling can be made more efficient.

Ans. (c) : Virtual memory is a memory management technique that is implemented using both hardware and software. Virtual machine can employ hardware support to increase performance of their virtual memory implementations.

46. The feasible region represented by the constraints $x_1 - x_2 < 1$, $x_1 + x_2 \geq 3$, $x_1 \geq 0$, $x_2 \geq 0$ of the objective function $\text{Max } Z = 3x_1 + 2x_2$ is

- (a) A polygon
(b) Unbounded feasible region
(c) A point
(d) None of these

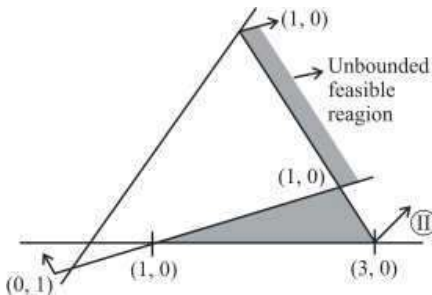
Ans. (b) : The objective function is

$$\text{Max} = 3x_1 + 2x_2 \quad \dots(i)$$

and constraints are

$$x_1 + x_2 = 1 \quad \dots(ii)$$

$$x_1 \geq 0, x_2 \geq 0; x_1 + x_2 \geq 3 \quad \dots(iii)$$



Feasible region is unbounded.

47. The colour of an object is largely determined by its diffuse reflection coefficient. If $K_d = (0.8, 0.4, 0)$, then what shall be the colour of the object, if the light used is blue and magenta?

- (a) White and Red (b) Red and Blue
(c) Black and White (d) Black and Red

Ans. (d) : The color of an object is largely determined by its diffuse reflection coefficient (K_d). K_d is assigned a value between 0.0 and 1.0.

0.0 – for dull surface that absorbs almost all light.

1.0– for string surface that reflects almost all light.

For the value (0.8, 0.4, 0) the color of the object will be black and red.

48. If an instruction takes 'i' microseconds and a page fault takes an additional 'j' microseconds. The effective instruction time, if on the average a page fault occurs every k instructions, is

- (a) $1 + \frac{j}{k}$ (b) $1 + j * k$
(c) $\frac{(i+j)}{k}$ (d) $(i+j) * k$

Ans. (a) : Given page fault rate $(1-p) = \frac{1}{K}$

Service time (m) = i

Page fault service time (S) = i + j

Therefore,

Effective memory access time is:

$$\begin{aligned} \text{EMAT} &= i \cdot \left(1 - \frac{1}{k}\right) + (i+j) \times \frac{1}{k} \\ &= \frac{k \cdot i - i}{k} + \frac{i+j}{k} \\ &= \frac{ki - i + i + j}{k} = \frac{ki + j}{k} \end{aligned}$$

$$\text{EMAT} = i + \frac{j}{k}$$

49. In any simplex table, if corresponding to any negative Δ_j , all elements of the column are negative or zero, the solution under the test is :

- (a) degenerate solution
(b) unbounded solution
(c) alternative solution
(d) non-existing solution

Ans. (b) : Procedure to test the basic feasible solution for optimality by the rules given :

Rule (i) : If all $\Delta_j \geq 0$, the solution under the test will be optimal. Alternate optimal solution will exist if any non-basic Δ_j is also zero.

Rule (ii) : If atleast one Δ_j is negative, the solution is not optimal and then proceeds to improve the solution in the next step.

Rule (iii) : If corresponding any negative Δ_j , all elements of the column x_j are negative or zero, then the solution under test will be unbounded. So, according to rule (iii) that is unbounded solution.

50. How many relations are there on a set with n elements that are symmetric and a set with n elements that are reflexive and symmetric?

- (a) $2^{n(n+1)/2}$ and $2^n \cdot 3^{n(n-1)/2}$
(b) $3^{n(n-1)/2}$ and $2^{n(n-1)}$
(c) $2^{n(n+1)/2}$ and $3^{n(n-1)/2}$
(d) $2^{n(n+1)/2}$ and $2^{n(n-1)/2}$

Ans. (d) : Symmetric relation : A relation R on set A is said to be symmetric if

(xRy) then (yRx) , $\forall x, y \in A$

Total number of symmetric relation with n element set

$$= 2^n \times 2^{\frac{n^2-n}{2}} = 2^{\frac{n(n+1)}{2}}$$

Total number of symmetric reflexive relation with n element set

$$= 1 \times 2^{\frac{n^2-n}{2}} = 2^{\frac{n(n-1)}{2}}$$

51. The strategy used to reduce the number of tree branches and the number of static evaluations applied in case of a game tree is

- (a) Minmax strategy
(b) Alpha-beta pruning strategy
(c) Constraint satisfaction strategy
(d) Static max strategy

Ans. (b) : Alpha-beta pruning is a search algorithm that seeks to decrease the number of nodes that are evaluated by the minimum algorithm in its search tree.

52. Match of following:

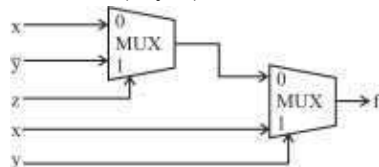
List-I		List-II	
A.	Regular Grammar	1.	Pushdown automaton
B.	Context free Grammar	2.	Linear bounded automaton
C.	Unrestricted Grammar	3.	Deterministic finite
D.	Context Sensitive Grammar	4.	Turning machine

Codes :

	A	B	C	D
(a)	3	1	2	4
(b)	3	1	4	2
(c)	3	2	1	4
(d)	3	2	4	1

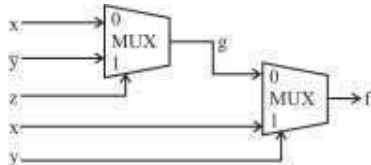
Ans. (b) :

53. Consider the below circuit and find the output function $f(x, y, z)$



- (a) $\bar{x}z + xy + \bar{y}z$ (b) $x\bar{z} + xy + \bar{y}z$
(c) $xz + xy + \bar{y}z$ (d) $xz + x\bar{y} + \bar{y}z$

Ans. (a) : Given logic diagram is :



Function f is :

$$\begin{aligned}
 &= y'(g) + y(x) \\
 &= y'(x.Z' + y'z) + x.y \\
 &= x.y'z' + y'z + x.y \\
 &= x(y + y'z') + y'z \\
 &= x(y + z') + y'z \\
 &= xy + x'z + y'z
 \end{aligned}$$

54. What is the size (in terms of bits) of Header length field in IPv4 header?

- (a) 2 (b) 4
(c) 8 (d) 16

Ans. (b) : Header length : The second field (4 bits) is the internet header length (IHL), which is the number of 32-bit words in the header. Since an IPv4 header may contain a variable number of options, this field specifies the size of the header (this is also coincides with the offset to the data). As a 4-bit field the minimum and maximum value of 5 and 15 respectively.

55. Match the following with respect to java. Util. * class methods:

List-I		List-II	
(a)	Bit Set	(1)	Time zone getTime zone ()
(b)	Calendar	(2)	int hashCode ()
(c)	Time zone	(3)	int nextInt ()
(d)	Random	(4)	Void setID (String tzName)

	A	B	C	D
--	---	---	---	---

(a)	2	1	4	3
-----	---	---	---	---

(b)	3	4	1	2
-----	---	---	---	---

(c)	4	3	2	1
-----	---	---	---	---

(d)	2	1	3	4
-----	---	---	---	---

Ans. (a) :

56. is sometimes said to be object oriented, because the only way to manipulate kernel objects is by invoking methods on their handles.

- (a) Windows NT (b) Windows XP
(c) Windows VISTA (d) Windows 95/98

Ans. (a) : Windows NT is sometimes said to object-oriented because the only way to manipulate Kernel objects is by invoking methods (API functions) on their handles. On the other hand, it lacks some of the most basic properties of object oriented systems such as inheritance and polymorphism.

57. A user level process in Unix traps the signal sent on a Ctrl + C input and has a signal handling routine that saves appropriate files before terminating the process. When a Ctrl + C input is given to this process, what is the mode in which the signal handling routine executes?

- (a) User mode (b) Kernel mode
(c) Super user mode (d) Privileged mode

Ans. (b) : The Kernel handles signals in the context of the process that receives them, so a process must run to handle signals.

58. CPU generally handles an interrupt by executing an interrupt service routine

- (a) As soon as an interrupt is raised
(b) By checking the interrupt register at the end of fetch cycle
(c) By checking the interrupt register after finishing the executing the current instruction
(d) By checking the interrupt register at fixed time intervals

Ans. (c) : After finishing the execution of each instruction the CPU reads the interrupt pins to recognize the interrupts.

59. The perspective projection matrix, on the view plane $z = d$ where the centre of projection is the origin $(0, 0, 0)$ shall be :

$$(a) \begin{bmatrix} 0 & 0 & 0 & d \\ 0 & 0 & d & 0 \\ 0 & d & 0 & 0 \\ d & 0 & 0 & 1 \end{bmatrix} \quad (b) \begin{bmatrix} d & 0 & 0 & 0 \\ 0 & d & 0 & 0 \\ 0 & 0 & d & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

$$(c) \begin{bmatrix} 0 & 0 & 0 & d \\ 0 & 0 & d & 0 \\ 0 & d & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix} \quad (d) \begin{bmatrix} d & 0 & 0 & 0 \\ 0 & d & 0 & 0 \\ 0 & 0 & d & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Ans. (b) : The projection transformation as a matrix

$$= \begin{bmatrix} d_0 & 0 & 0 & 0 \\ 0 & d_0 & 0 & 0 \\ 0 & 0 & d_0 & 0 \\ n_1 & n_2 & n_3 & 0 \end{bmatrix}$$

The plane $z = d$ is parallel, to the $x y$ plane ($N = K$)

$N(n_1, n_2, n_3) = (0, 0, 1)$ and $R_0(x_0, y_0, z_0) = (0, 0, d)$

So,

$$d_0 = n_1 x_0 + n_2 y_0 + n_3 z_0 = d$$

Therefore, the projection matrix is :

$$= \begin{bmatrix} d & 0 & 0 & 0 \\ 0 & d & 0 & 0 \\ 0 & 0 & d & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

60. Radio signals generally propagate according to the following mechanisms:

- Modulation, Amplification, Scattering
- Reflection, Diffraction, Scattering
- Amplification, Diffraction, modulation
- Reflection, Amplification, Diffraction

Ans. (b) : Reflection, diffraction and scattering are the three fundamental phenomenon that cause signal propagation in a mobile communication, apart from LOS communication.

61. Identify the devices given below with their IC numbers:

List-I	List-II
(A) USART	(1) 8251
(B) Micro controller	(2) 8051
(C) Interrupt controller	(3) 8259
(D) DMA controller	(4) 8257

	A	B	C	D
(a)	1	2	3	4
(b)	2	1	4	3
(c)	3	4	1	2
(d)	4	1	2	3

Ans. (a) :

- A USART (Universal synchronous/ asynchronous receiver/transmitter) is manufacturer by Intel number as 8251A.
- A microcontroller is a small computer on a single integrated circuit. Small device C compiler as 8051.
- One of best known programmable interrupt controller is 8259A, was included in the X86 PC.
- 8257 is known as microprocessor 8257 DMA controller.

62. The optimal solution of the following assignment problem using Hungarian method is

	(i)	(ii)	(iii)	(iv)
A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	26	24	10

Codes :

	A	B	C	D
(a)	(i)	(ii)	(iii)	(iv)
(b)	(i)	(iii)	(ii)	(iv)
(c)	(i)	(iii)	(iv)	(ii)
(d)	(i)	(iv)	(ii)	(iii)

Ans. (b) :

- Cost = $8 + 28 + 18 + 10 = 64$
- Cost = $8 + 4 + 19 + 10 = 41$
- Cost = $8 + 4 + 15 + 26 = 53$
- Cost = $8 + 26 + 19 + 24 = 77$

63. If a and b are the end points of a line, then which one of the following is true?

- If both end points are left, right, above or below the window, the line is invisible.
- If both end points are left, right, above or below the window, the line is completely visible.
- If both end points are left, right, above or below, the line is trivially visible.
- If both end point are left, right, above or below the window, the line is trivially invisible.

Ans. (d) : In simple visibility algorithm, if a and b are the end points of the line, with components x and y for each line. Visibility is true then check for totally invisible lines. If both endpoints are left, right, above or below the window, then line is trivially invisible.

64. Identify the devices given below with their IC numbers :

List-I	List-II
(A) Networked-Controlled Hand off (NCHO)	(1) MS connect to BS
(B) Mobile-Assisted Handoff (MAHO)	(2) Process via channel the target BS
(C) Forward Handoff	(3) First Generation Analog Cellular System
(D) Hard Handoff	(4) Second Generation Digital Cellular System

	A	B	C	D
(a)	3	4	2	1
(b)	2	3	1	4
(c)	2	1	4	3
(d)	4	3	1	2

Ans. (a) :

65. Consider the methods used by processes P_1 and P_2 for accessing their critical sections. The initial values of shared Boolean variables S_1 and S_2 are randomly assigned,

P_1	P_2
While ($S_1 = S_2$); critical section $S_1 = S_2$;	While ($S_1 = S_2$); critical section $S_1 = S_2$;

Which one of the following statements describes the properties achieved?

- (a) Mutual exclusion but not progress
- (b) Progress but not mutual exclusion
- (c) Neither mutual exclusion nor progress
- (d) Both mutual exclusion and progress

Ans. (c) : On first attempt both process can go into critical section simultaneously. So mutual exclusion is not satisfied.

After first attempt neither process can go into critical section. So progress is also not satisfied.

66. If the period of a signal is 1000 ms, then what is its frequency in kilohertz?

- (a) 10^{-3} KHz
- (b) 10^{-2} KHz
- (c) 10^{-1} KHz
- (d) 1 KHz

Ans. (a) : Frequency = $\frac{1}{1000 \text{ msec}} = 10^{-3} \text{ KHz}$

67. Let $a * H$ and $b * H$ be two co-sets of H .

- (i) Either $a * H$ and $b * H$ are disjoint
- (ii) $a * H$ and $b * H$ are identical

Then

- (a) only (i) is true
- (b) only (ii) is true
- (c) (i) or (ii) is true
- (d) (i) and (ii) is false

Ans. (c) : Theorem : Any two right (or left) co-sets of H are either disjoint or identical.

68. HTML is defined using SGML an standard, information processing-text and office systems (SGML) for text information processing.

- (a) ISO – 8878
- (b) ISO – 8879
- (c) ISO – 8880
- (d) ISO – 8881

Ans. (b) : The Standard Generalized Markup Language (SGML; ISO 8879 : 1986) is a standard for defining generalized markup language for documents.

69. What is the meaning of 'Hibernate' in Windows XP/Windows 7?

- (a) Restart the computers in safe mode.
- (b) Restart the computers in normal mode.
- (c) Shutdown the computer terminating all the running applications.
- (d) Shutdown the computer without closing the running applications.

Ans. (d) : Hibernation (or suspend to disk) in computing is powering down a computer while retaining its state. Upon hibernation the computer saves the contents its Random Access Memory (RAM) to a hard disk or other non-volatile storage.

70. Assume that we have constructor functions for both base class and derived class. Now consider the declaration in main(). Base * P = New Derived: in what sequence will the constructor be called?

- (a) Derived class constructor followed by Base class constructor
- (b) Base class constructor followed by derived class constructor.
- (c) Base class constructor will not be called.
- (d) Derived class constructor will not be called.

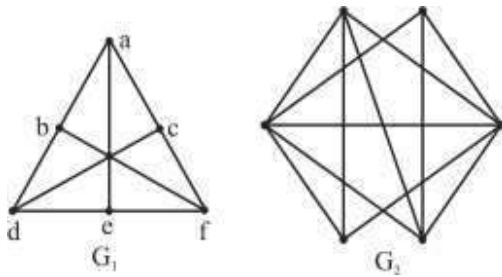
Ans. (b) : Here A derived class object is created first and then assigned to a base class pointer, whenever a derived class object is created, the base class constructor gets called first and then the derived class constructor.

71. Which one of the following options is not a shell in UNIX system?

- (a) Bourne Shell (b) C Shell
(c) Net Shell (d) Korn Shell

Ans. (c) : Net shell is a command line-based tool that enables administrators to remotely administer and configure critical network service. Net shell is not a shell of UNIX shell.

72. G_1 and G_2 are two graphs as shown :



- (a) Both G_1 and G_2 are planar graphs.
(b) Both G_1 and G_2 are not planar graphs.
(c) G_1 is planar and G_2 is not planar graph.
(d) G_1 is not planar and G_2 is planar graph

Ans. (d) : In planar graph :

(i) $e \leq 2n - 4$, (ii) $e \leq 3n - 6$ if Δ

G_1 : $n = 6$, $e = 9$

$\Rightarrow e \leq 2n - 4$

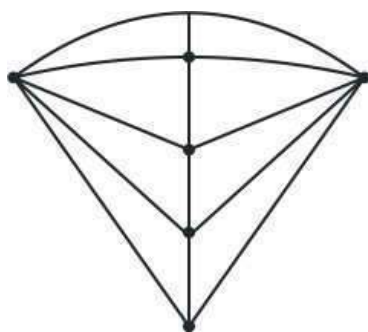
$\Rightarrow 9 \leq 2 \times 6 - 4$

$\Rightarrow 9 \leq 8$ false

G_2 : $N = 6$, $e = 11$

$\Rightarrow 11 \leq 3 \times 6 - 6$

$\Rightarrow 11 \leq 12$ true



Therefore, only G_2 is planar graph.

73. In which file the compiler manage the various objects, which are used in windows programming?

- (a) Control File (b) Binary File
(c) Text File (d) Obj File

Ans. (c) :

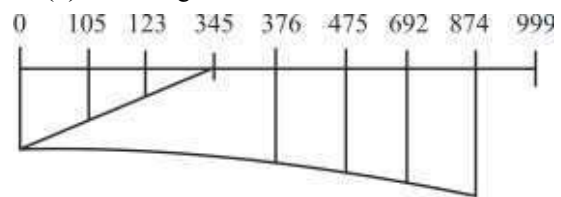
- Text files are stored in a form (usually ASCII) that is human readable.
- Control file is a small binary file that records the physical structure of the database.
- A binary file is computer readable but not human readable.
- Object file, and organized machine code file created by a compiler.

Microsoft windows computer test files are identified with the .txt file extension.

74. On a disk with 1000 cylinders (0 to 999) find the number of tracks, the disk arm must move to satisfy all the requests in the disk queue. Assume the last request service was at track 345 and the head is moving toward track 0. The queue in FIFO order contains requests for the following tracks; 123, 874, 692, 475, 105, 376 (Assume SCAN algorithm)

- (a) 2013 (b) 1219
(c) 1967 (d) 1507

Ans. (b) : Scan algorithm :



Total path = $(345 - 0) + (874 - 0) = 1219$

75. Half toning is defined as:

- (a) A technique to obtain increased visual resolution using multiple intensity levels.
(b) A technique for using minimum number of intensity levels to obtain increased visual resolution.
(c) A technique to obtain increased visual resolution using maximum number of intensity levels.
(d) A technique for using appropriate number intensity levels to obtain increased visual resolution.

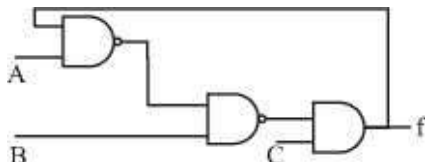
Ans. (b) : Antialiasing is a technique using multiple intensity levels to obtain increased visual resolution. Halftoning on the other hand, is a technique for using a minimum number of intensity levels, i.e. gray scaling or multiple intensity levels.

U.G.C. NET Exam. December, 2012

COMPUTER SCIENCE

(Solved with Explanation Paper-II)

1. Consider the circuit shown below. In a certain steady state, Y is at logical '1'. What are possible values of A, B, C?



- (a) A = 0, B = 0, C = 1
 (b) A = 0, B = C = 1
 (c) A = 1, B = C = 0
 (d) A = B = 1, C = 1

Ans. (a) : $f = \overline{A}f.B.C = (Af + \overline{B}.C)$

When the output is logic 1 the output equation is $1 = (Af + \overline{B}.C)$. To justify this equation 'C' must be always '1'

So, C=1, A=1, B=0

Or A=1, B=1

Or A=0, B=0

2. The worst case time complexity of AVL tree is better in comparison to binary search tree for
- (a) Search and Insert Operations
 (b) Search and Delete Operations
 (c) Insert and Delete Operations
 (d) Search, Insert and Delete Operations

Ans. (d) : Because search is $O(\log n)$ since AVL tree are always balanced, insertion & deletion are also $O(\log n)$

where as in case of BST is $O(n)$

3. The GSM network is divided into the following
- (a) SS, BSS, OSS (b) BSS, BSC, MSC
 (c) CELL, BSC, OSS (d) SS, CELL, MSC

Ans. (a) : SS, BSS, OSS

Because, GSM describe the protocols for second generation (2G) digital cellular network used by mobile phones, GSM supports voice call & data transfer speed of up to 9.6 kbps. It is based on the time division multiple access (TDMA) system. Currently GSM Network operate on the 850 Mhz, 900 Mhz, 1800 Mhz, 1900 Mhz frequency band.

4. The power set of the set $\{\phi\}$ is

- (a) $\{\phi\}$ (b) $\{\phi, \{\phi\}\}$
 (c) $\{0\}$ (d) $\{0, \phi, \{\phi\}\}$

Ans. (b) : $\{\phi, \{\phi\}\}$

Because If A is a infinite set then set of all subset of A is called power set A denoted by $P(A)$

Here, $A = \{\phi\}$

$P(A) = \{\phi, \{\phi\}\}$

So answer is (b)

5. If the disk head is located initially at 32, find the number of disk moves required with FCFS if the disk queue of I/O blocks requests are 98, 37, 14, 124, 65, 67

- (a) 239 (b) 310
 (c) 321 (d) 325

Ans. (c) : Because according to FCFS algorithm, Total disk moves = $(98-32) + (98-37) + (37-14) + (124-14) + (124-65) + (67-65) = 321$

So answer is (c)

6. Component level design is concerned with

- (a) Flow oriented analysis
 (b) Class based analysis
 (c) Both of the above
 (d) None of the above

Ans. (c) : Because Analysis model, manifested by scenario based, class based, flow oriented and behavioral elements, feed the design task.

using design notations and design methods, design produces a data design, an architectural design, an interface design and a component level design.

7. The 'C' language is

- (a) Context free language
 (b) Context sensitive language
 (c) Regular language
 (d) None of the above

Ans. (b) : Most of the programming languages like C, C++, Java etc. can be well approximated by CFG, and the compilers are made taking into account CFGs.

However, C language itself contains context sensitive properties

8. The Mobile Application Protocol (MAP) typically runs on top of which protocol?

- (a) SNMP (Simple Network Management Protocol)
 (b) SMTP (Simple Mail Transfer Protocol)
 (c) SS7 (Signalling System 7)
 (d) HTTP (Hyper Text Transfer Protocol)

Ans. (c) : Because, main SS7 functions are

- Setting up and tearing down circuit switched connections
- Advanced network features such as those offered by supplementary service
- SMS & EMS
- Mobility Management in Cellular Networks
- Support for in services

9. If a packet arrive with an M-bit value is '1' and a fragmentation offset value '0', then it is — fragment.

- (a) First (b) Middle
(c) Last (d) All of the above

Ans. (a) : Because, $M = 1$ indicates that this packet is not the last packet among all fragments
offset = 0 means this packet carries $0 * 8 = 0^{\text{th}}$ byte from the original packet
Hence answer is (a)

10. The number of bit strings of length eight that will either start with a 1 bit or end with two bits 00 shall be

- (a) 32 (b) 64
(c) 128 (d) 160

Ans. (d) : Because string starting with 1-8 places, 1 places fixed, 7 places have 2 choices $2^7 = 128$
ending with 00 - 8 places 2 fixed = $2^6 = 64$
Common string will be there that have been counted twice are starting with 1 and ending with 00. Such number of string will be.
Fix 3 position rest have a choices = 32
total = $128 + 64 - 32 = 160$

11. In compiler design 'reducing the strength' refers to

- (a) reducing the range of values of input variables.
(b) code optimization using cheaper machine instructions.
(c) reducing efficiency of program
(d) None of the above

Ans. (b) : Strength reduction is a compiler optimization technique where expensive operations are replaced with equivalent but less expressive operations. The classic example of strength reduction converts "strong" multiplications inside a loop weaker addition. Something that frequently occurs in array addressing.

12. In which addressing mode, the effective address of the operand is generated by adding a constant value to the contents of register?

- (a) Absolute (b) Indirect
(c) Immediate (d) Index

Ans. (d) : Index mode: The address of the operand is obtained by adding to the contents of the general register (called index register) a constant value.

13. Which of the following is true?

- (a) A relation in BCNF is always in 3NF.
(b) A relation in 3NF is always in BCNF.
(c) BCNF and 3NF are same.
(d) A relation in BCNF is not in 3NF.

Ans. (a) : BCNF: $FD \ x \twoheadrightarrow y$, where x is superkey of relation and y is attribute(s).

3NF: $FD \ x \rightarrow y$, where either x is a superkey of relation or y is a prime attributes.

There, BCNF is stronger than 3NF, means 3NF relations are subset of BCNF relations but converse may not be true.

14. Given memory partitions of 100 K, 500 K, 200 K, 300 K and 600 K (in order) and processes of 212 K, 417 K, 112 K, and 426 K (in order), using the first-fit algorithm, in which partition would the process requiring 426 K be placed?

- (a) 500 K (b) 200 K
(c) 300 K (d) 600 K

Ans. (*) 400 K cannot be placed. So, none option is true.

15. What is the size of the Unicode character in Windows Operating System?

- (a) 8-Bits (b) 16-Bits
(c) 32-Bits (d) 64-Bits

Ans. (b) : Because, Unicode is a worldwide character encoding standard. The system uses unicode exclusively and string manipulation.

These function use UTF – 16 (wide character) encoding. Which is most common encoding of unicode and the one used for native unicode encoding on windows operating system..

16. In which tree, for every node the height of its left subtree and right subtree differ almost by one?

- (a) Binary search tree
(b) AVL tree
(c) Threaded Binary Tree
(d) Complete Binary Tree

Ans. (b) : AVL tree is a self balancing binary search tree where the difference between heights of left and right subtrees cannot be more than one for all nodes. If at any time they differ by more than one, nodes. If at any time they differ by more than one, rebalancing is done to restore this property.

Hence the correct answer is (b)

17. The design issue of Datalink Layer in OSI Reference Model is

- (a) Framing
(b) Representation of bits
(c) Synchronization of bits
(d) Connection control

Ans. (a) : Because, framing is related to data link layer and option (b) and (c) are related to physical layer and option (D) is related to transport layer means framing is done at the data link layer whereas fragmentations is done as network layer and segmentation is done at transport layer.

18. Given the following expressions of a grammar

$$E \rightarrow E * F / F + E / F$$

$$F \rightarrow F - F / id$$

Which of the following is true?

- (a) * has higher precedence than +
- (b) – has higher precedence than *
- (c) + and – have same precedence
- (d) + has higher precedence than *

Ans. (b) : Because to check the precedence check the level in which the operator occurs lower the leveled higher the priority and vice versa as – is lower *, – has higher priority than *

So answer is (b)

19. The maturity levels used to measure a process are

- (a) Initial, Repeatable, Defined, Managed, Optimized.
- (b) Primary, Secondary, Defined, Managed, Optimized.
- (c) Initial, Stating, Defined, Managed, Optimized.
- (d) None of the above

Ans. (a) : Because, capability maturity model (CMM) is a development model created after a study of data collected from organizations. The term "maturity" relates to degree of formality and optimization of processes to formality defined steps, to managed result metrics, to active optimization of the process.

CMM Levels

- Level 1 > initial
- Level 2 > Repeatable
- Level 3 > Defined
- Level 4 > Managed
- Level 5 > Optimized

20. The problem of indefinite blockage of low-priority jobs in general priority scheduling algorithm can be solved using :

- (a) Parity bit
- (b) Aging
- (c) Compaction
- (d) Timer

Ans. (b) : Because a major problem with priority scheduling is indefinite blocking or starvation. A solution to the problem of indefinite blockage to the low priority process is aging. Aging is a technique of gradually increasing the priority of processes that wait in the system for a long period of time.

So option (b) is right choice.

21. Which API is used to draw a circle?

- (a) Circle ()
- (b) Ellipse ()

- (c) Round Rect ()
- (d) Pie ()

Ans. (b) : Because, Ellipse is the API which is use to draw a circle.

example : ellipse (56, 46, 55, 55);

⇒ An ellipse with an equal height and width is a circle. The first two parameters set the location, third sets the width and fourth sets the height.

22. In DML, RECONNECT command cannot be used with

- (a) OPTIONAL Set
- (b) FIXED Set
- (c) MANDATOR Set
- (d) All of the above

Ans. (b) : Fixed: a member record cannot exist on its own. Moreover, once it is inserted in a set occurrence, it is fixed if cannot be reconnected to another set occurrence.

Reconnect command: if the connection to the server is lost, automatically try to reconnect attempt is made each time the connection is lost. To suppress reconnection behavior, use "skip-reconnect".

23. Coaxial cables are categorized by Radio Government rating are adapted for specialized functions. Category RG-59 with impedance 75Ω used for

- (a) Cable TV
- (b) Ethernet
- (c) Thin Ethernet
- (d) Thick Ethernet

Ans. (a) : Because, Coaxial cable is a type of electrical cable that has an inner conductor surrounded by a tubular insulating layer and RG – 59/U is a specific type of Coaxial cable, often used for low-power video and RF signal connections. RG-59 Coaxial cable is commonly packed with consumer equipment, such as VCP's or digital cable receivers.

24. RAD stands for

- (a) Rapid and design
- (b) Rapid Aided Development
- (c) Rapid Application Development
- (d) Rapid Application Design

Ans. (c): Rapid application development (RAD) is a software development methodology that uses minimal planning in favor of rapid prototyping. A prototype is working model which is functionality equivalent to a component of the product.

25. Suppose that someone starts with a chain letter. Each person who receives the letter is asked to send it on to 4 other people. Some people do this, while some do not send any letter. How many people have seen the letter, including the first person, if no one receives more than one letter and if the chain letter ends after there have been 100 people who read it but did not send it out? Also find how many people sent out the letter?

- (a) 122 & 22
- (b) 111 & 11
- (c) 133 & 33
- (d) 144 & 44

Ans. (c) : Because, from basic, consider one sender, he sent to four other who only read "two" they send to seven other "three" they send to ten other receiver who only recall this form AP having common difference-3, & a/q total number of receiver who only read is 100 that is over last term.

$$\text{So, } 4 + (n-1) * 3 = 100$$

$n = 33$ this is the number of reader who send to four other already there are 100 viewer who only read

So total viewer will $100 + 33 = 133$

- 26. A hash function f defined as $f(\text{key}) = \text{key} \bmod 13$, with linear probing is used to insert keys 55, 58, 68, 91, 27, 145. What will be the location of 79?**

- (a) 1 (b) 2
(c) 3 (d) 4

Ans. (d) : Given, hash function $f(\text{key}) = \text{key} \bmod 13$ with linear probing to resolve collision.

Key are : 55, 58, 68, 71, 27, 145 and 79

$$55 \bmod 13 = 3$$

$$58 \bmod 13 = 6$$

$$65 \bmod 13 = 3 \text{ (collision, so next)} = 4$$

$$91 \bmod 13 = 0$$

$$27 \bmod 13 = 2$$

$$145 \bmod 13 = 2$$

$$79 \bmod 13 = 1 \text{ (collision, so next)}$$

$$= 2 \text{ (again collision, so next)}$$

$$= 3 \text{ (again collision, so next)}$$

$$= 4 \text{ (again collision, so next)}$$

$$= 5$$

So, index 5 is allotted to key 79.

- 27. Which of the following is true while converting CFG to LL (I) grammar?**

- (a) Remove left recursion alone
(b) Factoring grammar alone
(c) Both of the above
(d) None of the above

Ans. (c): LL (I) is top-down parser, for top down parser the grammar should be unambiguous, deterministic and free from infinite loop. That means grammar should be free from ambiguity, left factoring and left recursion. All the 3 condition must be satisfied for LL (I) parser.

So option (c) is the right answer.

- 28. Identify the Risk factors which are associated with Electronic payment system.**

- (a) Fraudulent use of Credit Cards.
(b) Sending Credit Card details over internet.
(c) Remote Storage of Credit Card details.
(d) All of the above

Ans. (d) : All are given risk factors that which are associated with electronic payment system.

- Fraudulent use of credit card
- Sending credit card details over internet
- Remote storage of credit card details

So answer is (D)

- 29. Which of the following are two special functions that are meant for handling exception that occurs during exception handling itself?**

- (a) Void terminate () and Void unexpected ()
(b) Non void terminate () and void unexpected ()
(c) Void terminate () and non void unexpected ()
(d) Non void terminate () and non void unexpected ()

Ans. (a) : The exception handling mechanism relies on two function, terminate () and unexpected (), for coping with errors related to the exception handling mechanism itself.

Void terminate ()

- If an exception is thrown but not caught
- If the exception handling mechanism find the stack is corrupted.
- If a destructor propagates an exception during stack unwinding due to another exception.

Void unexpected

If a function throws an exception by its exception specification then:

- The stack is unwounded for the function
- The function unexpected () is called

- 30. Which of the following memory allocation scheme suffers from external fragmentation?**

- (a) Segmentation
(b) Pure demand paging
(c) Swapping
(d) Paging

Ans. (a): Segmentation is a memory management technique in which each job is divided into several segments of different sizes, one for each module that contains pieces that perform related function. Each segment is loaded into a contiguous block of available memory.

External fragmentation exists when total free memory is enough for the new process but it's not contiguous and cannot satisfy the request. Segmentation suffers from external fragmentation and paging suffers from internal fragmentation.

- 31. Basis path testing falls under**

- (a) system testing
(b) white box testing
(c) black box testing
(d) unit testing

Ans. (b): White Box testing is technique that examines the program structure and derives test data from the program code.

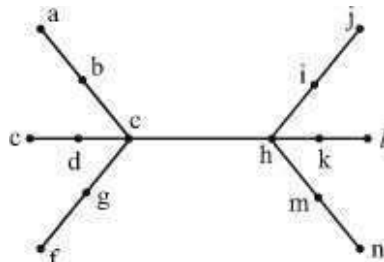
Basic path testing or structural testing is white box method for designing test cases. The method analyzes the control flow graph of program to find a set of linearly independent paths of execution.

32. The User Work Area (UWA) is a set of Program variables declared in the host program to communicate the contents of individual records between

- (a) DBMS & the Host record
- (b) Host program and Host record
- (c) Host program and DBMS
- (d) Host program and Host language

Ans. (c): The User Work Area (UWA) is set of program variables declared in host program to communicate contents of individual records between DBMS and host program, one program variable for each record type with same format.

33. Consider the tree given below :



- (a) d & h
- (b) c & k
- (c) g, b, c, h, i, m
- (d) c & h

Ans. (d) : Eccentricity of vertex : The maximum distance between a vertex to all other vertices is considered as the eccentricity of vertex denoted by (v). The distance from a particular vertex to all other vertices in the graph is taken and among those distances, the eccentricity is the highest of distances for this graph,

e(a) = 5	e(b) = 4	e(c) = 3
e(d) = 4	e(e) = 5	e(f) = 5
e(a) = 4	e(h) = 3	e(i) = 4
e(j) = 5	e(k) = 4	e(l) = 5
e(m) = 4	e(n) = 5	

Radivs

r (c) = 3 & r (n) = 3 which is the minimum eccentricity for c & h.

Center

e (v) = r (v),

Then v is the central point of graph G.

Here

e(o) = r (c) = 3 & e(h) = r(h) = 3

Hence both c & h are center of tree

Hence option (d) is right answer.

34. The maximum number of keys stored in a B-tree of order m and depth d is

- (a) $md + 1 - 1$
- (b) $\frac{md + 1 - 1}{m - 1}$
- (c) $(m - 1)(md + 1 - 1)$

$$(d) \frac{md - 1}{m - 1}$$

Ans. (a)

$n_0 \rightarrow (m - 1)$ keys children m, node 1

$n_1 \rightarrow m \times (m - 1)$ keys children

$n_2 \rightarrow m \times m \times (m - 1)$ keys

.

.

$n_d \rightarrow m^d \times (m - 1)$ keys

$$= (m - 1) + m(m - 1) + m^2(m - 1) + \dots + m^d(m - 1)$$

$$= (m - 1) \cdot (1 + m + m^2 + \dots + m^d)$$

$$= (m - 1) \left(\frac{m^{(d+1)} - 1}{m - 1} \right)$$

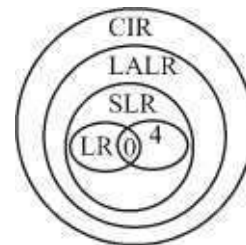
$$= m^{(d+1)-1} \text{ should be ans.}$$

35. Which of the following is the most powerful parring method?

- (a) LL(1)
- (b) Canonical LR
- (c) SLR
- (d) LALR

Ans. (b) : Canonical LR

Because, LR > LALR > SLR



A canonical LR parser or LR(1) parser is a LR(k) parser for K=1, i.e., with single look ahead terminal.

LR(1) parser are more powerful than LALR parsers and LALR parsers are more powerful than SLR.

36. In UNIX, which of the following command is used to set the task priority?

- (a) init
- (b) nice
- (c) kill
- (d) PS

Ans. (b): Nice command directly maps to a kernel call of the same name. Nice is used to invoke a utility or shell script with a particular priority, thus giving the process more or less CPU time than other processes.

37. AES is a round cipher based on the Rijndael Algorithm that uses a 128-bit block of data. AES has three different configurations. — rounds with a key size of 128 bits, rounds with a key size of 192 bits and rounds with a key size of 256 bits.

- (a) 5, 7, 15
- (b) 10, 12, 14
- (c) 5, 6, 7
- (d) 20, 12, 14

Ans. (b) AES is a round cipher based on the Rijndael algorithm that uses a 128 bit block of data.

10 rounds with a key size of 128 bits, 12 rounds with a key size of 192 bits, 14 rounds with a key size of 256 bits.

38. Match the following IC families with their basic circuits:

- | | |
|---------|-------------|
| a. TTL | 1. NAND |
| b. ECL | 2. NOR |
| c. CMOS | 3. Inverter |

Code :

- | | a | b | c |
|-----|---|---|---|
| (a) | 1 | 2 | 3 |
| (b) | 3 | 2 | 1 |
| (c) | 2 | 3 | 1 |
| (d) | 2 | 1 | 3 |

Ans. (a)

(a) **TTL**—Transistor–transistor logic is a logic family built from bipolar junction transistors. It satisfies the NAND.

(b) **ECL**—Emitter coupled logic is a high speed integrated circuit bipolar transistor logic family. It satisfies the NOR.

(c) **CMOS** – Complementary metal oxide semiconductor is a technology for constructing Integrated Circuits. It satisfies inverter.

So answer is (a).

39. Match the following with respect to C++ data types :

- | | |
|----------------------|--------------|
| a. User defined type | 1. Qualifier |
| b. Built in type | 2. Union |
| c. Derived type | 3. Void |
| d. Long double | 4. Pointer |

Code :

- | | a | b | c | d |
|-----|---|---|---|---|
| (a) | 2 | 3 | 4 | 1 |
| (b) | 3 | 1 | 4 | 2 |
| (c) | 4 | 1 | 2 | 3 |
| (d) | 3 | 4 | 1 | 2 |

Ans. (a)

(a) **User defined data type**—This technique of grouping different values is referred to as class. It offers three techniques of defining a new data type, a structures class, a union, so it satisfies (2) union.

(b) **Built in type**—This is use to store information of various data types. So it is a void.

(c) **Derived type**—Derived type can mean a composite data type, a subtype, a derived class, So it satisfies (4) pointer

(d) **Long double**—It refers to a floating point data type, 8 it satisfies qualifier.

40. Given an empty stack, after performing push (1), push (2), Pop, push (3), push (4), Pop, Pop, push (5), Pop, what is the value of the top of the stack?

- | | |
|-------|-------|
| (a) 4 | (b) 3 |
| (c) 2 | (d) 1 |

Ans. (d) Because operation

P	P	P	P	P	P	P	P	P
u	u	o	u	u	o	o	u	o
s	s	p	s	s	p	p	s	p
h	h		h	h			h	
(1)	(2)		(3)	(4)			(5)	
				4				
	2		3	3	3		5	
1	1	1	1	1	2	1	1	1

Push is the operation that which adds an element to the collection, pop that is present in the stack. Therefore, popped sequence is: 2, 4, 3 and 5 remaining element to be popped is only 1 on the stack. So answer is (d)

41. Enumeration is a process of

- Declaring a set of numbers
- Sorting a list of strings
- Assigning a legal values possible for a variable
- Sequencing a list of operators

Ans. (c): An enumeration is a complete ordered listing of the entire item in a collection. The term is commonly used in mathematic and computer science to refer to a listing of all of the elements of a set.

Only certain pre-defined values are allowed.

Each valid value is assigned a name, which is then normally used instead of integer when working with this data type.

42. Which of the following mode declaration is used in C++ to open a file for input?

- | | |
|-----------------|---------------|
| (a) ios :: app | (b) in :: ios |
| (c) ios :: file | (d) ios :: in |

Ans. (d) : iOS :: in//open for input operations.

43. Data Encryption Techniques are particularly used for ———.

- protecting data in Data Communication System.
- reduce Storage Space Requirement.
- enhances Data Integrity.
- decreases Data Integrity.

Ans. (a) : Because, Data encryption is a security in which information is encoded in such away that only authorized reader can read it and data encryption is particularly used for protecting data in data communication system.

So answer is (a).

44. Let L be a set accepted by a non-deterministic finite automaton. The number of states in non-deterministic finite automaton is $|Q|$. The maximum number of states in equivalent finite automaton that accepts L is

- (a) $|Q|$ (b) $2|Q|$
(c) $2^{|Q|} - 1$ (d) $2^{|Q|}$

Ans. (d): Because, conversion from NFA to DFA is done by subset construction. If a problem can be solved with state in NFA then in worst case number of states in the resulting DFA is 2^n

Given number of states in NFA = $|Q|$

Then maximum number of states in equivalent

DFA = $2^{|Q|}$

Hence, option (d) is correct choice.

**45. What is the result of the following expression?
(1 & 2) + (3 & 4)**

- (a) 1 (b) 3
(c) 4 (d) 0

Ans. (d): Given $(1 \& 2) + (3 \& 4)$ in decimal
= $(001 \& 010) + (011 \& 100)$ in binary
= $(000) + (000) = (000)$
= 0 in decimal.

Hence answer is (d).

46. Back propagation is a learning technique that adjusts weights in the neural network by propagating weight changes.

- (a) Forward from source to sink
(b) Backward from sink to source
(c) Forward from source to hidden nodes
(d) Backward from source to hidden nodes

Ans. (b): Back propagation, an abbreviation for "backward propagation of error" is a learning technique that adjusts weights in neural network by propagating weight changes backward from the sink to the source nodes.

47. Match the following:

- | | |
|---------|---------------------------|
| a. TTL | 1. High fan out |
| b. ECL | 2. Low propagation delay |
| c. CMOS | 3. High power dissipation |

Code:

- | | a | b | c |
|-----|---|---|---|
| (a) | 3 | 2 | 1 |
| (b) | 1 | 2 | 3 |
| (c) | 1 | 3 | 2 |
| (d) | 3 | 1 | 2 |

Ans. (a)

(a) TTL—Transistor-transistor logic is a digital logic design. TTL is characterized by high switching speed. It has high power dissipation.

(b) ECL—Emitter coupled logic is a high speed integrated circuit bipolar transistor logic family. In ECL, transistor are never in saturation, the input/output voltage have a swing (0.8v), the input impedance is high and output resistance is low. So it has low propagation delay.

(c) CMOS — Complementary metal oxide semiconductor is a technology for constructing IC's CMOS technology is used in microprocessors, static RAM & other digital logic circuit. It has high fan out.

48. _____ is an "umbrella" activity that is applied throughout the software engineering process.

- (a) Debugging
(b) Testing
(c) Designing
(d) Software quality assurance

Ans. (d): Because, umbrella activities include:

- (1) Software Project Management
- (2) Formal Technical reviews
- (3) Software Quality assurance
- (4) Measurement
- (5) Risk Management
- (6) Reducibility Management

Hence (d) is the answer.

49. Identify the operation which is commutative but not associative?

- (a) OR (b) NOR
(c) EX-OR (d) NAND

Ans. (d) : Because, $0 \text{ NAND } 1 = 1 \text{ NAND } 0 = 1 \Rightarrow$ Cumulative

$(0 \text{ NAND } 1) \text{ NAND } 1 = 1 \text{ NAND } 1 = 0$

$0 \text{ NAND } (1 \text{ NAND } 1) = 0 \text{ NAND } 0 = 1 \Rightarrow$ Not associative

- Every logic gate follows commutative law
- AND, OR, Ex-OR, Ex-NOR follows associative law, NOR does not follow associative law.
- AND, OR, follows distributive law. Ex-OR, Ex-NOR, NAND, NOR does not follow distributive law.

So answer is (d).

50. Given a Relation POSITION (Posting No, Skill), then query to retrieve all distinct pairs of posting-nos. requiring skill is

- (a) Select p.posting-No, p.posting-No
from position p
where p.skill = p.skill
and p.posting-No < p.posting-No
- (b) Select p₁.posting-No, p₂.posting-No
from position p₁, position p₂
where p₁.skill = p₂.skill
- (c) Select p₁.posting-No, p₂.posting-No
from position p₁, position p₂
where p₁.skill = p₂.skill
and p₁.posting-No < p₂.posting-No
- (d) Select p₁.posting-No, p₂.posting-No
from position p₁, position p₂
where p₁.skill = p₂.skill
and p₁.posting-No = p₂.posting-No

Ans. (c) : Because, we need to join position with itself based on skill.

Then it is given distinct pairs so we need to consider only $P_1 \text{ Posting - no} < P_2 \text{ Posting - no}$.

U.G.C. NET Exam. December, 2012

COMPUTER SCIENCE

(Solved with Explanation Paper–III)

1. Eco system is a Frame work for

- (a) Building a Computer System
- (b) Building Internet Market
- (c) Building Offline Market
- (d) Building Market

Ans. (b) : Eco system is a Frame work for building internet market means once you built content, it needs to be shared across the web so it will done by building internet market.

2. The efficiency (E) and speed up (sp) for Multiprocessor with p processors satisfies

- (a) $E \leq p$ and $s_p \leq p$
- (b) $E \leq 1$ and $s_p \leq p$
- (c) $E \leq p$ and $s_p \leq 1$
- (d) $E \leq 1$ and $s_p \leq 1$

Ans. (b) : Efficiency (E) can be 0 to 1 or not more than 100%. even 1 is just theoretical speed up for multiprocessor. Speed of multiprocessor S_p can never exceed (p) number of processors.
So answer is (b).

3. Match the following :

List-I

- A. Critical region
- B. Wait/signal
- C. Working set
- D. Dead lock

List-II

- 1. Hoares Monitor
- 2. Mutual exclusion
- 3. Principal of locality
- 4. Circular wait

Codes :

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 2 | 1 | 3 | 4 |
| (b) | 1 | 2 | 4 | 3 |
| (c) | 2 | 3 | 1 | 4 |
| (d) | 1 | 3 | 2 | 4 |

Ans. (a) :

(a) Critical region–Critical region is the region of values that corresponds to the rejection of the null hypothesis at some chosen probability level. So it satisfies, (ii) Mutual exclusion

(b) Wait/Signal holds Hoares Monitor

(c) Working Set–It directly address thrashing problem in which is the set of pages referenced by the process during the most recent w page reference is the principle of locality.

(d) Dead lock–It hold circular wait because circular wait is a condition of dead lock.

4. The technique of temporarily delaying outgoing acknowledgements so that they can be hooked onto the next outgoing data frame is known as

- (a) Bit stuffing
- (b) Piggy backing
- (c) Pipelining
- (d) Broadcasting

Ans. (b) : The technique of temporarily delaying outgoing acknowledgements, so that they can be hooked onto the next outgoing data frame is known as piggy backing.

5. _____ is process of extracting previously non known valid and actionable information from large data to make crucial business and strategic decisions.

- (a) Data Management
- (b) Data base
- (c) Data Mining
- (d) Meta Data

Ans. (c) : Data mining is defined as extracting information from huge sets of data, we can say that mining is the procedure of mining knowledge of data.

6. The aspect ratio of an image is defined as

- (a) The ratio of width to its height measured in unit length.
- (b) The ratio of height to width measured in number of pixels.
- (c) The ratio of depth to width measured in unit length
- (d) The ratio of width to depth measured in number of pixels.

Ans. (a) : Because the aspect ratio of an image describes the proportional relationship between its width and height. It is commonly expressed as two number separated by a color, as in 16:9.

7. Which of the following features will characterize an OS as multi-programmed OS?

- (A) More than one program may be loaded into main memory at the same time.
- (B) If a program waits for certain event another program is immediately scheduled.
- (C) If the execution of a program terminates, another program is immediately scheduled.
- (a) (A) only
- (b) (A) and (B) only
- (c) (A) and (C) only
- (d) (A), (B) and (C) only

Ans. (d) : A Multiprogramming system permits multiple programs to be loaded into memory and execute the programs concurrently. Concurrent execution of programs results into improved system throughput and resource, utilization. This potential is realized by a class of operating system among a multiple of active programs. Such operating systems usually have the prefix multi in their names, such as multitasking or multiprogramming.

8. Using RSA algorithm, what is the value of cipher text C, if the plain text M = 5 and p = 3, q = 11 & d = 7 ?

- (a) 33 (b) 5
(c) 25 (d) 26

Ans. (d) :

Given P = 3, Q = 11, n = (p × q) = 3 × 11 = 33

m = (P-1) × (Q-1) = (2 × 10) = 20

find a small odd integer, that is relatively prime to M.

If e = 3, then GCD (3, 20) = 1. e should be small & prime & So we let e = 3, d is given, d = 7

public key = (e, n). (values of e and n are known)

To encrypt a message we apply the public key to the function $E(s) = S^e \pmod n$

Where S is the given message and e and n represents the public key integer pair. In the above question, the plain text M = 5 plain text needs to be encrypted using above formula

$$\begin{aligned} &= 5^3 \pmod{33} \\ &= 125 \pmod{33} \\ &= 26 \end{aligned}$$

9. You are given an OR problem and a XOR problem to solve. Then, which one of the following statements is true?

- (a) Both OR and XOR problems can be solved using single layer perception.
(b) OR problem can be solved using single layer perception and XOR problem can be solved using self organizing maps.
(c) OR problem can be solved using radial basis function and XOR problem can be solved using single layer perception.
(d) OR problem can be solved using single layer perception and XOR problem can be solved using radial basis function.

Ans. (d) : OR problem can be solved using single layer perception and XOR problem can be solved using radial basis function.

10. Match the following :

- | List-I | List-II |
|----------------------|---------|
| a. Application layer | 1. TCP |
| b. Transport layer | 2. HDLC |
| c. Network layer | 3. HTTP |
| d. Data layer | 4. BGP |

Codes :

- | | a | b | c | d |
|-----|---|---|---|---|
| (a) | 2 | 1 | 4 | 3 |
| (b) | 3 | 4 | 1 | 2 |
| (c) | 3 | 1 | 4 | 2 |
| (d) | 2 | 4 | 1 | 3 |

Ans. (c) :

(a) **Application layer**—It is the top most layer in OSI & TCP/IP layered model & when we use a web browser, which is actually using Hyper Text Transfer

Protocol (HTTP) to interact with the Network. HTTP is an application layer protocol.

(b) **Transport layer**—It offers peer to peer & end to end connection between two processes on remote hosts. It have TCP (Transmission Control Protocol) & UDP (User Datagram Protocol).

(c) **Network layer**—It takes the responsibility for routing packets from source to destination within or outside a subnet. So it refers BGP (Border Gateway Protocol)

(d) **Data link layer**—It hides the details of underlying H/W and represents itself to upper layer as the medium to communicate. So it refers HDLC (High Level Data Link Control).

11. The time complexities of some standard graph algorithms are given. Match each algorithm with its time complexity? (n and m are no. of nodes and edges respectively)

- | | |
|-----------------------------|------------------|
| a. Bellman Ford algorithm | 1. $O(m \log n)$ |
| b. Kruskals algorithm | 2. $O(n^3)$ |
| c. Floyd Wrashall algorithm | 3. $O(mn)$ |
| d. Topological sorting | 4. $O(n + m)$ |

Codes :

- | | a | b | c | d |
|-----|---|---|---|---|
| (a) | 3 | 1 | 2 | 4 |
| (b) | 2 | 4 | 3 | 1 |
| (c) | 3 | 4 | 1 | 2 |
| (d) | 2 | 1 | 3 | 4 |

Ans. (a) :

- (a) Bellman Ford algorithm time complexity is $O(mn)$
(b) Kruskals algorithm time complexity is $O(m \log n)$
(c) Floyd Wrashall algorithm time complexity is $O(n^3)$
(d) Topological sorting time complexity is $O(n + m)$

Where n & m are number of nodes and edges respectively.

12. Let $V_1 = 2I - J + K$ and $V_2 = I + J - K$, then the angle between V_1 & V_2 and a vector perpendicular to both V_1 & V_2 shall be :

- (a) 90° and $(-2I + J - 3K)$
(b) 60° and $(2I + J + 3K)$
(c) 90° and $(2I + J - 3K)$
(d) 90° and $(-2I - J + 3K)$

Ans. (d) : $V_1 \cdot V_2 = (2I - J + K) \cdot (I + J - K)$
 $= 2 - 1 - 1 = 0$

Hence angle between V_1 and V_2 is 90°

$$\begin{aligned} V_1 \times V_2 &= \begin{vmatrix} I & J & K \\ 2 & -1 & 1 \\ 1 & 1 & -1 \end{vmatrix} \\ &= I(-1-1) - J(-2-1) + K(-2-1) \\ &= -2I - J + 3K \end{aligned}$$

So answer will be (b).

$$(c) \frac{n!}{n_1!n_2!n_3!\dots n_k!}$$

$$(d) \frac{n_1!n_2!\dots + n_k!}{n_1! - n_2! - n_3! - \dots - n_k!}$$

Ans. (c) : Because, the number of ways to distribute n distinguishable objects into K distinct boxes so that n_i objects are placed in box i , $i = 1, \dots, k$ & $n_1 + \dots + n_k = n$ is $n! / (n_1! n_2! n_3! \dots n_k!)$.

21. How many solutions do the following equations have?

$$x_1 + x_2 + x_3 = 11$$

$$\text{where } x_1 \geq 1, x_2 \geq 2, x_3 \geq 3$$

- (a) C(7, 11) (b) C(11, 3)
(c) C(14, 11) (d) C(7, 5)

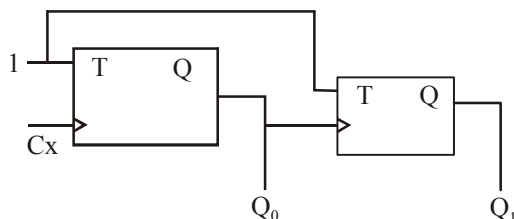
Ans. (d) : Given, equation is: $x_1 + x_2 + x_3 = 11$
where $x_1 \geq 1, x_2 \geq 2, x_3 \geq 3$
when we satisfied given conditions, then
 $x_1 + x_2 + x_3 = 11 - (1+2+3) = 5$
 $x_1 + x_2 + x_3 = 5$
hence, number of possible solutions are:
 ${}^{(n-1)+k}C_k = {}^{(3-1)+5}C_5 = {}^7C_5 = {}^7C_2$

22. Which provides an interface to the TCP/IP suit protocols in Windows 95 and Windows NT?

- (a) FTP Active-X Control
(b) TCP/IP Active-X Control
(c) Calinsock Active-X Control
(d) HTML Active-X Control

Ans. (c) : Calinsock Active-X Control
Because, the window Sockets API (WSA), which was later shortened to winsock, is a technical specification that defines how windows network software should access network services. It defines a standard interface between a windows TCP/IP client application and the underlying TCP/IP protocol stack. The nomenclature is based on the Berkeley Sockets API model used in BSD for communication between programs.

23. What are the final values of Q_1 and Q_0 after 4 clock cycles, if initial values are 00 in the sequential circuit shown below :



- (a) 11 (b) 10
(c) 01 (d) 00

Ans. (d) :

T	Qn+1
0	Qn
1	Qn

T ₀	Q ₀	T ₁	Q ₁
Initially	0		0
1	1	1	1
1	0	1	1
1	1	1	0
1	0	1	0

Therefore, $Q_1 Q_0$ sequence is:
 $00_{\text{initial}} \rightarrow 11_{1\text{st}} \rightarrow 10_{2\text{nd}} \rightarrow 01_{3\text{rd}} \rightarrow 00_{4\text{th}}$

24. If dual has an unbounded solution, then its corresponding primal has

- (a) no feasible solution
(b) unbounded solution
(c) feasible solution
(d) none of these

Ans. (a) : no feasible solution

Because, few property of primal & dual

- (1) The dual of dual linear programming problem is again the primal solution.
- (2) If either the primal or dual problem has unbounded solution the other problem has no feasible solution.
- (3) If either the primal has a finite optimal solution the other one also possesses the same & the optimal value of the objective function of 2 problems are same.

So answer is (a).

25. The number of distinct bracelets of five beads made up of red, blue, and green beads (two bracelets are indistinguishable if the rotation of one yield another) is,

- (a) 243 (b) 81
(c) 51 (d) 47

Ans. (c) Verify that any necklace may be characterized via one of the patterns below.

Recall that there are $\frac{3!}{(3-n)!}$ ways to put 3 things into n ordered slots.

$$xxxxx : 3 = \frac{3!}{(3-1)!}$$

$$xxxxy : 6 = \frac{3!}{(3-2)!}$$

$$xxxxyy : 6 = \frac{3!}{(3-2)!}$$

$$xxxxyz : 6 = \frac{3!}{(3-3)!}$$

$$xxyyz : 6 = \frac{3!}{(3-3)!}$$

$$xxyxy : 6 = \frac{3!}{(3-2)!}$$

$$xxyxz : 6 = \frac{3!}{(3-3)!}$$

$$xxyzy : 6 = \frac{3!}{(3-3)!}$$

$$xyzyz : 6 = \frac{3!}{(3-2)!}$$

$$3+6+6+6+6+6+6+6 = 51$$

26. Which are the classifications of data used in Mobile Applications?

- (a) Private data, User data, Shared data.
- (b) Public data, User data, Virtual data.
- (c) Private data, Public data, Shared data.
- (d) Public data, Virtual data, User data.

Ans. (c) : private data are those data that are not made available to the general public such as password and accounts. **Public data** are those data that are for the public good. **Shared data** are those data that are a set amount of data for all smart phones user on a specific plan. Shared data plans include both text message & calling.

27. In an enhancement of a CPU design, the speed of a floating point unit has been increased by 20% and the speed of a fixed point unit has been increased by 10%. What is the overall speed achieved if the ratio of the number of floating point operations to the number of fixed point operations is 2 : 3 and the floating point operation used to take twice the time taken by the fixed point operation in original design?

- (a) 1.2
- (b) 1.55
- (c) 1.85
- (d) 1.285

Ans. (b) : Because, speed up = original time taken/new time taken

Let x be the time for a fixed point operation original time taken = $(3x + 2 \cdot 2x) / 5 = 7x / 5$

New time taken = $((3x / 1.1) + 4x / 1.2) / 5 = 8x / 1.32 \cdot 5$

So speed up = $7 \cdot 1.32 / 8 = 1.155$

28. The initial basic feasible solution to the following transportation problem using Vogel's approximation method is

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	1	2	1	4	30
S ₂	3	3	2	1	50
S ₃	4	2	5	9	20
Demand	20	40	30	10	

- (a) $x_{11} = 20, x_{13} = 10, x_{21} = 20,$
 $x_{23} = 20, x_{24} = 10, x_{32} = 10,$
 Total cost = 180

- (b) $x_{11} = 20, x_{12} = 20, x_{13} = 10,$
 $x_{22} = 20, x_{23} = 20, x_{24} = 10,$
 Total cost = 180
- (c) $x_{11} = 20, x_{13} = 10, x_{22} = 20,$
 $x_{23} = 20, x_{24} = 10, x_{32} = 10,$
 Total cost = 180
- (d) None of the above

Ans. (c) :

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	1(20)	2(10)	1	4	30
S ₂	3	3(10)	2(30)	1(10)	50
S ₃	4	2(20)	5	9	20
Demand	20	40	30	10	

The minimum total transportation cost is=
 $1 \times 20 + 2 \times 10 + 3 \times 10 + 2 \times 30 + 1 \times 10 + 2 \times 20 = 180$

So answer is (c).

29. 58 lamps are to be connected to a single electric outlet by using an extension board each of which has four outlets the number of extension boards needed to connect all the light is

- (a) 29
- (b) 28
- (c) 20
- (d) 19

Ans. (d) : Because, Connect first 4 lamps (L₁, L₂, L₃, L₄) to extension 1 & take power from extension 2. In extension 2 we can connect only 3 lamps because out of 4 one port is busy to supply power to extension 1. Similarly, for other extension we can connect only 3 lamps because one port is busy to supply power to other extension.

We can connect 4 lamps to first extension.

number of extension required for remaining 54 lamps = 18 extension.

Total extension required to connect all 58 lamps = 18 + 1 = 19

30. Match the following with respect to the Mobile Computing Architecture.

List-I

List-II

- a. Downlink control
- b. Radio communication data rate
- c. The average duration of user's stay in cell
- d. FDDI bandwidth
- 1. 100 Mbps
- 2. Residency latency (RL)
- 3. Sending data from a BS to MD
- 4. 2-Mbps

Codes :

- | | a | b | c | d |
|-----|---|---|---|---|
| (a) | 2 | 1 | 4 | 3 |
| (b) | 3 | 4 | 2 | 1 |
| (c) | 4 | 1 | 2 | 1 |
| (d) | 4 | 3 | 1 | 2 |

Ans. (b) : Because,

- (1) Downlink control is sending a data from BS to MD. Use of Downlink Control in Mobile computing Architecture: The base station subsystem (BSS) is the section of a traditional cellular telephones network which is responsible for handling traffic & signaling between a Mobile Device & the network switching subsystem.
- (b) Data Communication data rate is 2 Mbps
- (c) User are highly mobile and randomly enter and exit from cells. There is a parameter called Residence Latency (RL), which characterizes the average duration of a user's stay in the cell.
- (d) FDDI (Fiber Distributed Data Interfere) specifies 100 mbps token passing, dual-ring LAN using fiber-optic cable.

31. Which of the following flags are set when 'JMP' instruction is executed?

- (a) SF and CF
- (b) AF and CF
- (c) All flags
- (d) No flag is set

Ans. (d) : The JMP instruction transfers extension to the address generated by adding the 8-bits value in the accumulator to the 16-bits value in the DPTR register. Neither the accumulator nor the DPTR register are altered. No flags are affected by this instruction.

32. A thread is a light weight process. In the above statement, weight refers to

- (a) time
- (b) number of resources
- (c) speed
- (d) All the above

Ans. (b) : A thread is a light weight process, light weight process means same-resources like memory can be shared between threads.
So answer is (b).

33. The Z-buffer algorithm is used for Hidden surface removal of objects. The maximum number of objects that can be handled by this algorithm shall

- (a) Depend on the application
- (b) be arbitrary no of objects
- (c) Depend on the memory availability
- (d) Depend on the processor

Ans. (b) : In z-buffer-algorithm at each pixel we keep track of the distance to the closest surface that has been drawn so far; and we throw away fragments that are farther away than that distance. The closest distance is stored by allocating an extra value for each pixel, in addition to the red, green and blue color values, which is known as the depth or value. The maximum number of objects that can be handled by this algorithm shall be arbitrary number of objects.

34. The power set of AUB, where

A = {2, 3, 5, 7} and B = {2, 5, 8, 9} is

- (a) 256
- (b) 64
- (c) 16
- (d) 4

Ans. (b) : Because, $A = \{2, 3, 5, 7\}$ and $B = \{2, 5, 8, 9\}$
 $A \cup B = \{2, 3, 5, 7, 8, 9\}$

Power set going to have 2^6 elements which is 64
So the answer is (b)

35. In Win 32, which function is used to create Windows Applications?

- (a) Win APP
- (b) Win API
- (c) Win Main
- (d) Win Void

Ans. (c) : Win main is the function which is provided to create windows application. The user provided entry point for a graphical windows based application.

36. Suppose a processor does not have any stack pointer registers, which of the following statements is true?

- (a) It cannot have subroutine call instruction.
- (b) It cannot have nested subroutine calls.
- (c) Interrupts are not possible.
- (d) All subroutine calls and interrupts are possible.

Ans. (d) : It cannot have subroutine call instruction because in nested subroutine calls we used to push old subroutines into stack and pointing most recent call with stack pointer.

37. Everything below the system call interface and above the physical hardware is known as

- (a) Kernel
- (b) Bus
- (c) Shell
- (d) Stub

Ans. (a) : The kernel: consists of everything below the system call interface and above the physical hardware. Provides the file system, CPU-scheduling, memory management and other operating system functions; a large number of functions for one level.

38. Which is not the correct statement?

- (a) The class of regular sets is closed under homomorphisms.
- (b) The class of regular sets is not closed under inverse homomorphisms.
- (c) The class of regular sets is closed under quotient.
- (d) The class of regular sets is closed under substitution.

Ans. (b) : Because, The class of regular set is not enclosed under inverse homomorphism but actually regular sets is closed under inverse homomorphism.

39. When a programming Language has the capacity to produce new data type, it is called as

- (a) Overloaded Language
- (b) Extensible Language
- (c) Encapsulated Language
- (d) Abstraction Language

Ans. (b) : Because, It supports the style of computer programming that focuses on mechanisms to extend the programming language, compiler & runtime environment. It must be possible to add new keywords, concepts, and structures to the source languages.

40. Which of the following operating system is better for implementing client-server network?

- (a) Windows 95 (b) Windows 98
(c) Windows 2000 (d) All of these

Ans. (c) : Because, windows 2000 is the latest one. window Server 2000 is an operating system for use on both client and server computers.

41. Consider a system having m resources of the same type. These resources are shared by 3 processes A, B and C which have peak demands of 3, 4 and 6 respectively. For what value of m deadlock will not occur?

- (a) 7 (b) 9
(c) 10 (d) 13

Ans. (d) : Because, There are 3 processes A, B and C which have peak demands of 3, 4 and 6 respectively. Maximum number of resources that deadlock can be happen: $\leq (3-1) + (4-1) + (6-1)$
Minimum number of resources that deadlock can not be happen: $m \geq (3-1) + (4-1) + (6-1) + 1$
 $m \geq 11$

42. The grammar 'G₁'

$S \rightarrow OSO \mid ISI \mid 0 \mid 1 \in$ and the grammar 'G₂' is

$S \rightarrow as \mid asb \mid X, X \rightarrow Xa \mid a.$

Which is the correct statement?

- (a) G₁ is ambiguous, G₂ is unambiguous
(b) G₁ is unambiguous, G₂ is ambiguous
(c) Both G₁ and G₂ are ambiguous
(d) Both G₁ and G₂ are unambiguous

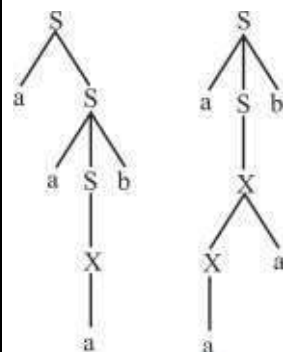
Ans. (b) given grammar G₁:

$s \rightarrow OSO \mid ISI \mid 0 \mid 1 \in$ is unambiguous.

Grammar G₂: $S \rightarrow aS \mid aSb \mid X$

$X \rightarrow Xa \mid a$

For string $w=aaab$, there are two parse tree:



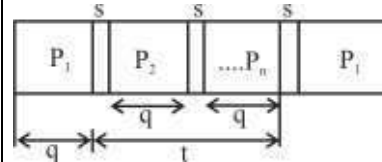
Hence, grammar G₂ is ambiguous grammar,

43. Consider n processes sharing the CPU in round robin fashion Assuming that each process

switch takes a seconds. What must be the quantum size q such that the overhead resulting from process switching is minimized but, at the same time each process is guaranteed to get its turn at the CPU at least every t seconds?

- (a) $q \leq \frac{t-ns}{n-1}$ (b) $q \geq \frac{t-ns}{n-1}$
(c) $q \leq \frac{t-ns}{n+1}$ (d) $q \geq \frac{t-ns}{n+1}$

Ans. (a) : according to given data



Therefore, $q(n-1) + n.s \leq t$

$q(n-1) \leq t - n.s$

$$q \leq \frac{t-ns}{n-1}$$

So answer is (a).

44. The Default Parameter Passing Mechanism is called as

- (a) Call by Value
(b) Call by Reference
(c) Call by Address
(d) Call by Name

Ans. (a) : Call by Value

The call by value method of passing arguments to a function copies the actual value of an argument into the formal parameter of the function. C does not support call by reference, call by address directly. It access call by reference or address by point.

So the default Parameter Passing Mechanism is call by value, Hence the answer is (a).

45. Which of the following regular expression identities are true?

- (a) $(r+s)^* r^* s^*$
(b) $(r+s)^* = r^* + s^*$
(c) $(r+s)^* = (r^* s^*)^*$
(d) $r^* + s^* = r^* s^*$

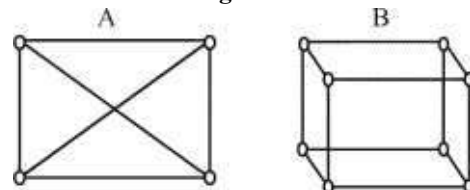
Ans. (c) : $(r+s)^* = (r^* s^*)^*$

Because, Try generating string from both sides.

$$(r+s)^* = (r^* + s^*)^* = (r^* s^*)^* = (r^* s^*)^* = (r + s^*)^* = a^* (ba^*)^* = b^* (ab^*)^*$$

Hence answer is option (c).

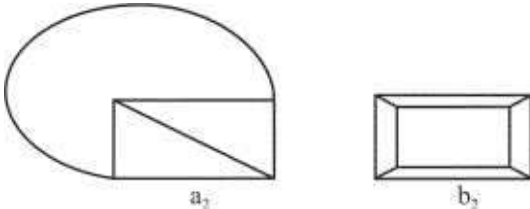
46. Two graphs A and B are shown below : Which one of the following statement is true?



- (a) Both A and B are planar.
 (b) Neither A nor B is planar.
 (c) A is planar and B is not.
 (d) B is planar and A is not.

Ans. (a) : Both A and B are planar.

A planar graph is a graph that can be embedded in the plane. i.e. it can be drawn on the plane in such a way that its edges intersect only at their-end points. It means, it can be drawn in such a way that no edges cross each other.



Hence correct option is (a).

47. The minimum number of states of the non-deterministic finite automation which accepts the language

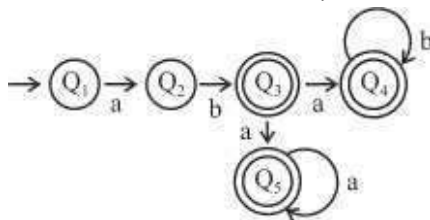
$\{a b a^n \mid n \geq 0\} \cup \{a b a^n \mid n \geq 0\}$ is

- (a) 3 (b) 4
 (c) 5 (d) 6

Ans. (c) : 5

Because, $L = \{a b a^n \mid n \geq 0\} \cup \{a b a^n \mid n \geq 0\}$

$L = \{ab, aba, abaa, abab, ababb, \dots\}$



The minimum number of states of the non-deterministic finite automation which accepts the language = 5

Hence option (c) is the answer.

48. Functions defined with class name are called as

- (a) Inline function (b) Friend function
 (c) Constructor (d) Static function

Ans. (c) : Constructor

Because, constructor has same name as class it

- Constructors don't have return type.
- Constructor is called when object is created.
- If we do not specify constructor then compiler generates a default constructor

49. Let f be the fraction of a computation (in terms of time) that is parallelizable, P the number of processors in the system, and s_p the speed up achievable in comparison with sequential execution – then the s_p can be calculated using the relation :

- (a) $\frac{1}{1-f-f/P}$ (b) $\frac{P}{P-f(P+1)}$
 (c) $\frac{1}{1-f+f/P}$ (d) $\frac{P}{P+f(P-1)}$

Ans. (c) : $\frac{1}{1-f+f/P}$

Because,

- Let execution time without parallelisms 1
- If f is the fraction of parallel computation (1-f) time must be spend for sequential computation.
- f fraction of computation can be distributed among P processors : So it will take f/p time to complete computation
- Total time for computation with parallelism = $1 - f + f/p$ speed up = time without parallelism/time with parallelism. = $1/(1-f+f/p)$

50. Which of the following definitions generates the same Language as L ,

where $L = \{WW^R \mid W \in \{a,b\}^*\}$

- (a) $S \rightarrow asb \mid bsa \mid \epsilon$
 (b) $S \rightarrow asa \mid bsa \mid \epsilon$
 (c) $S \rightarrow asb \mid bsa \mid asa \mid bsb \mid \epsilon$
 (d) $S \rightarrow asb \mid bsa \mid asa \mid bsb$

Ans. (b) : A palindrome is a word, phrase number or other sequence of characters which reads the same backward or forward, given language

$S \rightarrow asa \mid bsa \mid \epsilon$

$L = \{WW^R \mid W \in \{a,b\}^*\}$

This language accepts even length of palindrome.

The set of strings generated by $L =$

$\{\epsilon, aa, abba, baab, bbbbbb, bbaabb-\}$

\Rightarrow We eliminate the (A), (C) because that is not even length palindrome, In option (b) accepts all even length palindrome. Ex : $\epsilon, aa, bb, aaaa, abba, baab, bbbb$.

\Rightarrow So option (b) is the answer.

51. Suppose there are \log_n sorted lists of $n \log_n$ elements each. The time complexity of producing a sorted list of all these elements is (use heap data structure)

- (a) $O(n \log \log_n)$ (b) $\theta(n \log_n)$
 (c) $\Omega(n \log_n)$ (d) $\Omega(n^{3/2})$

Ans. (a) : $O(n \log \log_n)$

Since we have \log_n lists we can make a min heap of \log_n elements by taking the first element from each of the \log_n sorted lists. Now, we start deleting the min-element from the heap and put the next elements from the sorted list from which that element was added to the heap. In this way each delete and the corresponding

insert will take $O(\log \log_n)$ time as delete in heap size n is $O(\log_n)$ & inserting an element on a heap of size n is also $O(\log_n)$. Now, we have a total of $\log_n \times \frac{n}{\log_n} = n$ elements.

So total time will be $O(n \log \log_n)$

52. Consider the program below in a hypothetical programming language which allows global variables and a choice of static or dynamic scoping int i;

program Main()

```
{
    i = 10;
    call f ( );
}
procedure f ( )
{
    int i = 20;
    call g ( );
}
procedure g ( )
{
```

print i;

Let x be the value printed under static scoping and y be the value printed under dynamic scoping. Then x and y are

- (a) $x = 10, y = 20$ (b) $x = 20, y = 10$
(c) $x = 20, y = 20$ (d) $x = 10, y = 10$

Ans. (a) : In static scoping, the scope of an identifier is determined by its location in the code, and since that doesn't change, the scope doesn't either.

In dynamic scoping, the scope is determined by sequence of calls that has held to the use of an identifier and since that can be different each time that use is reached, is dynamic.

$x = 10, y = 20$

Since the value of x is based on static scoping in the procedure $g()$ print i will directly look into the global scope & find $i = 10$ which was previously set by $\text{main}()$

Since the value of y is based on dynamic point, procedure $g()$ will first look into the function which called its i.e. procedure $f()$ which has a local $i = 20$, which will be taken & 20 will be printed.

53. If the parse tree of a word w generated by a Chomsky normal form grammar has no path of length greater than i , then the word w is of length

- (a) no greater than 2^{i+1} (b) no greater than 2^i
(c) no greater than 2^{i-1} (d) no greater than i

Ans. (c) : no greater than 2^{i-1}

It a parse tree for a word string w is generated by a MF & the parse tree

- has a path length of at most i ,
- then the length of w is at most $2^{(i-1)}$

So answer is (c).

54. The Object Modeling Technique (OMT) uses the following three kinds of model to describe a system

- (a) Class Model, Object Model and Analysis Model.
(b) Object Model, Dynamic Model, and Functional Model.
(c) Class Model, Dynamic Model and Functional Model.
(d) Object Model, Analysis Model and Dynamic Model.

Ans. (b) : Object Modeling technique (OMT) has types of models.

(i) **Object Model** – It represents the static modeled domain. Main concepts are classes are association with attributes & operations. Aggregation & generalization are predefined relationships.

(ii) **Dynamic Model** – It represents view on the model main concepts are states, transitions between states, and events to trigger transitions. Action can be modeled as occurring within states generalization and aggregation are predefined relationship.

(iii) **Functional model** – It handles the process persecuting of the model, corresponding roughly to data flow diagrams. Main concepts are process, data store, and data flow. OMT is a predecessor of the unified modeling language (UML)

55. The factors that determine the quality of a software system are

- (a) Correctness, reliability
(b) efficiency, usability, maintainability
(c) testability, portability, accuracy, error tolerances, expandability, access control, audit.
(d) All of the above

Ans. (d) : All of the above

The ISO 9126 – 1 Software Quality

Model identifies 6 main qualities

Characteristics namely: Functionality, Reliability, Usability, Efficiency, Maintainability, Portability

56. If a relation with a Schema R is decomposed into two relations R_1 and R_2 such that $(R_1 \cup R_2) = R_1$ then which one of the following is to be satisfied for a lossless joint decomposition (\rightarrow indicates functional dependency)

- (a) $(R_1 \cap R_2) \rightarrow R_1$ or $R_1 \cap R_2 \rightarrow R_2$
(b) $R_1 \cap R_2 \rightarrow R_1$
(c) $R_1 \cap R_2 \rightarrow R_2$
(d) $R_1 \cap R_2 \rightarrow R_1$ and $R_1 \cap R_2 \rightarrow R_2$

Ans. (a) : Let $R(A, B, C)$ and B is the key
 Let $R_1 = (A, B)$ and $R_2 = (B)$ So $R_1 \cup R_2 = R_1$
 Definition of lossless D : says that if the intersection of two relation has a common attribute and that is a key in any of the relation then it is lossless
 Now $R_1 \cap R_2 = B \dots$ AND $B \rightarrow R_1$
 So lossless and it can also be stated that
 $R_1 \cap R_2 = B \dots$ AND $B \rightarrow R_2 \dots$
 So lossless therefore if we have any one of the above then it is lossless

57. Given the following statements :

- (i) Recursive enumerable sets are closed under complementation.
- (ii) Recursive sets are closed under complementation.

Which is/are the correct statements?

- (a) only (i)
- (b) only (ii)
- (c) both (i) and (ii)
- (d) neither (i) nor (ii)

Ans. (b) : only (ii)
 Recursive enumerable sets are not closed under complementation.
 Recursive languages are closed under complement.
 So the answer is (b).

58. Skolemization is the process of

- (a) bringing all the quantifiers in the beginning of a formula in FDL.
- (b) removing all the universal quantifiers.
- (c) removing all the existential quantifiers.
- (d) all of the above

Ans. (c) : Because, Skolemization is the process of removing all the existential quantifiers. It is one of the steps in conversion of first order logic sentences into its equivalent CNF (conjunctive normal form)

59. Which level of Abstraction describes how data are stored in the data base?

- (a) Physical level
- (b) View level
- (c) Abstraction level
- (d) Logical level

Ans. (a) : Physical level is the lowest level of data abstraction. This level describes how data is actually stored in the physical memory or database.

60. The transform which possesses the "multi-resolution" property is

- (a) Fourier transform
- (b) Short-time-Fourier transform
- (c) Wavelet transform
- (d) Karhunen-Loere transform

Ans. (c) : A multi resolution analysis (MRA) or multi scale approximation (MSA) is the design method of most of the practically relevant discrete wavelet transform (DWT) & the justification for the algorithm of the fast wavelet transform (FWT)
 Wavelet transforms are broadly divided into three classes continuous, discrete and multi-resolution based.

61. Which one is a collection of templates and rules?

- (a) XML
- (b) CSS
- (c) DHTML
- (d) XSL

Ans. (d) : XSL stands for extensible style sheet language and is a style sheet language for XML documents. An XSL style sheet is like with CSS, a file that describes how to display an XML document of a given type.

62. A program P calls two subprograms P₁ and P₂. P₁ can fail 50% times and P₂ 40% times. Then P can fail

- (a) 50%
- (b) 60%
- (c) 10%
- (d) 70%

Ans. (d) : Program P fails when either P₁ fails or P₂ fails i.e. failure of P₁ failure of P₂.

But this will also contain the case when both P₁ & P₂ fails at same time i.e. failure of P₁ failure of P₂, since this case will be already be counted on (P₁ + P₂)

Therefore, our final answer will be failure of P₁ + failure of P₂ - (failure of P₁ \cap failure of P₂)

$$\Rightarrow \left(\frac{50}{100}\right) + \left(\frac{40}{100}\right) - \left(\frac{50}{100} \times \frac{40}{100}\right)$$

$$\Rightarrow \left(\frac{90}{100}\right) - \left(\frac{2000}{10000}\right)$$

$$= \left(\frac{20}{100}\right) - \left(\frac{200}{1000}\right) = \left(\frac{70}{100}\right) = 70\%$$

63. Third normal form is based on the concept of —.

- (a) Closure Dependency
- (b) Transitive Dependency
- (c) Normal Dependency
- (d) Functional Dependency

Ans. (b) : Transitive Dependency

Third normal form (3NF) is a normal used in data base normalization.

■ The relation R (table) is in second normal form 2MF

■ Every non-prime attribute of R is not-transitively dependent on every key of R.

A non-prime attribute of R is an attribute that does not belong to any candidate key of R.

A transitive dependency is a functional dependency in which $X \rightarrow Z$ indirectly, by virtue of

$X \rightarrow Y$ & $Y \rightarrow Z$ (where it is not the case that $Y \rightarrow X$)

So the option is (b).

64. If the Fourier transform of the function $f(x, y)$ is $F(m, n)$, then the Fourier transform of the function $f(2x, 2y)$ is :

- (a) $\frac{1}{4} F\left(\frac{m}{2}, \frac{n}{2}\right)$
- (b) $\frac{1}{4} F(2m, 2n)$

$$(c) \frac{1}{4}F(m, n) \quad (d) \frac{1}{4}F\left(\frac{m}{4}, \frac{n}{4}\right)$$

Ans. (a) : To determine the factor by which the frequency change, recalls

$$f(\omega) = \int_{-\infty}^{\infty} f(x) e^{2\pi i \omega x} dx$$

Replace x with 2x. Then

$$f(\omega) = \int_{-\infty}^{\infty} f(2x) e^{4\pi i x \omega} dx$$

Let, $2x = u$,

$$\text{Then, } \frac{du}{dx} = 2 \text{ or } dx = \frac{du}{2}$$

Substituting gives :

$$f(\omega) = \frac{1}{2} \int_{-\infty}^{\infty} f(u) e^{2\pi i \omega u} du$$

But this integral is the same as the defining integral for the Fourier transform for $f(x)$ with x' replaced with u 's. Therefore,

$$f(\omega) = \frac{1}{2} F(\omega')$$

But we know $\omega' = m/2$

so $F(\omega)$ for $f(2x)$ is $\frac{1}{2} F\left(\frac{m}{2}\right)$

By similar argument,

$$\text{for } f(3y), F(\omega) = \frac{1}{2} F\left(\frac{m}{2}\right)$$

Combining the functions gives the Fourier transform, for $f(2x, 2y)$ as $\frac{1}{2} F\left(\frac{m}{2}, \frac{n}{2}\right)$

65. establishes information about when, why and by whom changes are made in a software.

- (a) Software Configuration Management.
- (b) Change Control.
- (c) Version Control.
- (d) An Audit Trail.

Ans. (d) : An Audit Trail.

A record showing who has accessed a computer system and what operations he or she has performed during a given period of time. Audit trails are useful both for maintaining security and for recovering lost transactions.

66. Match the following with respect to HTML tags and usage.

- | List-I | List-II |
|---------|--------------------------------------|
| a. CITE | 1. Italic representation |
| b. EM | 2. Represents output from programmes |
| c. VAR | 3. Represents to other source |
| d. SAMP | 4. Argument to a programme |

Codes :

	a	b	c	d
(a)	3	1	4	2
(b)	2	3	1	4
(c)	4	2	3	1
(d)	1	3	4	1

Ans. (a) :

- (a) CITE – defines the title of a work.
- (b) EM – defines emphasized text.
- (c) VAR – defines the variable
- (d) SAMP – defines the sample output from a computer system.

So answer is (a).

67. An expert system shell is an expert system without

- (a) domain knowledge
- (b) explanation facility
- (c) reasoning with knowledge
- (d) all of the above

Ans. (a) : domain knowledge: A shell is an expert system without a knowledge base. A shell furnishes the expert system developer with the inference engine, user interface, and the explanation and knowledge acquisition facilities.

68. An example of a dictionary-based coding technique is

- (a) Run-length coding
- (b) Huffman coding
- (c) Predictive coding
- (d) LZW coding

Ans. (d) : LZW coding

Option A, B, C all are statistical based coding techniques. In statistical based coding techniques we will encode text according to the frequent occurrence of the alphabets.

Hence option (d) : **LZW Coding** is universal lossless data compression algorithms is the algorithm the widely used in the GIF image format. It's an example for dictionary based compression algorithm. It uses a dictionary to code the input text

69. Which is the method used to retrieve the current state of a check box?

- (a) get State ()
- (b) put State ()
- (c) retrieve State ()
- (d) write State ()

Ans. (a) : get State ()

Get state method returns the current state. `Java.lan.Thread.get state ()` method returns the state of this thread. It is designed for use in monitoring of the system state, not for synchronization control.

So `get state ()` can retrieve the current state of check box.

70. Referential integrity is directly related to

- (a) Relation key
- (b) Foreign key
- (c) Primary key
- (d) Candidate key

Ans. (b) : Foreign key: is a field in one table that uniquely identifies a row of another table or the same table. This is sometimes called a referencing to any other data.

71. You are given four images represented as

$$I_1 \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}, I_2 = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix},$$

$$I_3 \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, I_4 = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix},$$

The value of entropy is maximum for image

- (a) I_1 (b) I_2
(c) I_3 (d) I_4

Ans. (c) : I_3

Entropy of image represents the randomness in pixels. In I_2 all pixels are same entropy is 0 : in I_3 2 pixels are same other 2 different in I_2 , I_4 , 3 are same So most random is in I_3

72. A cryptarithmic problem of the type

SEND

+ MORE

MONEY

Can be solved efficiently using

- (a) depth first technique
(b) breadth first technique
(c) constraint satisfaction technique
(d) bidirectional technique

Ans. (c) : Constraint satisfaction technique is a genre of mathematical puzzles in which the digits are replaced by letters of the alphabet or other symbols. It has one to one correspondence.

In this cryptarithmic problem there are some constraints like.

- (1) no two alphabets can have same number
- (2) every number can have values in the range 0 – 9

By considering these constraints we will solve the above problem which satisfy these constraints like M will be 1 as it is carry & so on.

73. Match the following :

List-I

List-II

- | | |
|---------------------------|---|
| a. Supervised learning | 1. The decision system receives rewards for its action at the end of a sequence of steps. |
| b. Unsupervised learning | 2. Manual labels of inputs are not used. |
| c. Reinforcement learning | 3. Manual labels of inputs are used. |
| d. Inductive learning | 4. System learns by example |

Codes :

	a	b	c	d
(a)	1	2	3	4
(b)	2	3	1	4
(c)	3	2	4	1
(d)	3	2	1	4

Ans. (d) : Reinforcement learning is an area of machine learning inspired by behaviorist psychology concerned with how software agent ought to take actions in an environment so as to maximize some notion of cumulative reward C-1

Inductive learning uses learn by example system.

Supervised learning is the machine learning task of inferring a function from labeled training data. There may manual labels of inputs are used.

Unsupervised learning is a type of machine learning algorithm used to draw inferences from data sets consisting of input data without labeled responses.

Hence answer is (d)

74. A algorithm is guaranteed to find an optimal solution if

- (a) h' is always 0.
(b) g is always 1.
(c) h' never overestimates h .
(d) h' never underestimates h .

Ans. (c) : h' never overestimates h

A^* is a computer algorithm that is widely used in path finding & graph traversal.

A^* is an informed search algorithm, or a best-first search, meaning that it solves problems by searching among all possible paths to the solution for the one that incurs the smallest cost.

A^* algorithm is guaranteed to find an optimal solution if h' never overestimates h .

75. Let $\theta(x, y, z)$ be the statement " $x + y = z$ " and let there be two quantifications given as

- (i) $\forall x \forall y \exists z \theta(x, y, z)$
(ii) $\exists z \forall x \forall y \theta(x, y, z)$

Where x, y, z are real numbers. Then which one of the following is correct?

- (a) (i) is true and (ii) is true.
(b) (i) is true and (ii) is false.
(c) (i) is false and (ii) is true.
(d) (i) is false and (ii) is false.

Ans. (b) : (i) is true and (ii) is true.

$x + y = z$ for all x for all y there exist some z which will satisfy this equation as e.g. $x = 4351$ $y = 1111$ then some $z = 5462$ is there and so on

for some z say $z = 100$ there do not exist all x and all y (there exist only some x, y) which satisfies this equation hence (ii) is false.

So answer is (b).

U.G.C. NET Exam. June, 2013

COMPUTER SCIENCE

(Solved with Explanation Paper-II)

Note: This paper contains *fifty* (50) objective type questions of two (2) marks each. All questions are compulsory. The candidates are required to select the most appropriate answer of each question.

1. COCOMO stands for

- (a) Composite Cost Model
- (b) Constructive Cost Model
- (c) Constructive Composite Model
- (d) Comprehensive Construction Model

Ans (b) The constructive cost model (COCOMO) is a procedural software cost estimation model developed by W. Boehm. The model uses a basic regression formula with parameters that are derived from historical project data and current as well as future project characteristics.

2. Match the following :

List-I

- (a) Good quality
- (b) Correctness
- (c) Predictable
- (d) Reliable

List-II

- 1. Program does not fail for a specified time in a given environment
- (2) Meets the functional requirements
- (3) Meets both functional and non-functional requirements
- (4) Process is under statistical control

Codes:

	A	B	C	D
(a)	3	2	4	1
(b)	2	3	4	1
(c)	1	2	4	3
(d)	1	2	3	4

Ans (a) Correctness meets the functional requirements. Good quality more than just correctness meets both functional and non-functions requirements.

Reliability is a characteristic which states that program does not fail for a specific time in given environment. Predictable means process in under statistical control and so is predictable.

3. While estimating the cost of software, Lines Of Code (LOC) and Function Points (FP) are used to measure which one of the following?

- (a) Length of code
- (b) Size of software
- (c) Functionality of software
- (d) None of the above

Ans (b) Lines of Code (LOC) is a software metric used to measure the size of a computer program by counting the number of lines in the text of the program's source code.

A **function point** is a "unit of measurement" to express the amount of business functionally an information system (as a product) provides to a user. Function points are used to compute a functional size measurement of software. The cost (in dollars or hours) of a single unit is calculated from past projects.

4. A good software design must have

- (a) High module of coupling, High module cohesion
- (b) High module coupling, Low module cohesion
- (c) Low module coupling, High module cohesion
- (d) Low module coupling, Low module cohesion

Ans (c) Cohesion is a measure that defines the degree of intra-dependability within elements of a module.

Coupling is a measure that defines the lines of inter-dependability among modules of a program. It tells at what lines the modules interface and interact with each other.

All good software have low coupling and high cohesion.

5. Cyclometric complexity of a flow graph G with n vertices and e edges is

- (a) $V(G) = e + n - 2$
- (b) $V(G) = e - n + 2$
- (c) $V(G) = e + n + 2$
- (d) $V(G) = e - n - 2$

Ans (b) The cyclomatic complexity of a structured program is defined with reference to the control flow graph of the program, a directed graph containing the basic blocks of the program, with an edge between two basic blocks if control may pass from the first to the second. The complexity M is then defined as

$$M = E - N + 2P$$

where, E is the number of edges, N is the number of vertices and P is the number of connected components. For a single program (or subroutine or method), P is always equal to 1. So, a simpler formula for a single subroutine is:

$$M = E - N + 2$$

6. When the following code is executed what will be the value of x and y ?

int x = 1, y = 0

y = x++ ;

- (a) 2, 1
- (b) 2, 2
- (c) 1, 1
- (d) 1, 2

Ans (a) y = x++; returns y then increases x. Initially given x is 1. So, y is set to 1 and then x is incremented to 2.

7. How many values can be held by an array $A[-1, m; 1, m]$?

- (a) m (b) m^2
(c) $m(m+1)$ (d) $m(m+2)$

Ans (d) $A[-1, m][1, m]$ is two dimensional array where,

Total number of rows = $m - (-1) + 1 = (m + 2)$

Total number of columns = $m - 1 + 1 = m$

Therefore, size of the array is = $m * (m + 2)$

8. What is the result of the expression $(1 \& 2) + 3/4$?

- (a) 1 (b) 2
(c) 3 (d) 4

Ans (d) 01
AND 10
(1 & 2) is a bitwise AND operation, i.e., 00
(3/4) give 4 as integer result.
Therefore, $(1 \& 2) + (3/4) = 0 + 4 = 4$

9. How many times the word 'print' shall be printed by the following program segment?

for ($i = 1, i \leq 2, i++$)

for ($j = 1, j \leq 2, j++$)

for ($k = 1, k \leq 2, k++$)

Printf("print / n")

- (a) 1 (b) 3
(c) 6 (d) 8

Ans (d) For $i = 1, j = 1$
2 times the word will be printed.
for $i = 1, j = 2$
2 times the word will be printed.
for $i = 2, j = 1$
2 times the word will be printed.
for $i = 2, j = 2$
2 times the word will be printed.

10. Which of the following is not a type of Database Management System?

- (a) Hierarchical (b) Network
(c) Relational (d) Sequential

Ans (d) There are four structural types of database management systems.

1. Hierarchical database.

2. Network database.

3. Relational database.

4. Object oriented database.

But sequential is not a database model.

11. Manager's salary details are to be hidden from Employee Table. This Technique is called as

- (a) Conceptual level Datahiding
(b) Physical level Datahiding
(c) External level Datahiding
(d) Logical level Datahiding

Ans (c) Data hiding is a software development technique used in OOP. It is mainly used to hide internal object details, i.e., the design decisions in a program that are most likely to change.

There are three form of schema, physical conceptual and external.

External data hiding is tailored to the needs of a particular category of users. Portions of stored data should not be seen by some users and begins to implement a level of security and simplifies the view for these users.

12. A Network Schema

- (a) restricts to one to many relationship
(b) permits many to many relationship
(c) stores Data in a Database
(d) stores Data in a Relation

Ans (b) 1. Network model permits the modeling of many to many relationships in data. A set consists of an owner record type, a set name, and member a member record type.

2. The network data structure looks like a tree structure, except that a dependent node called a child node may have more than one parent or owner node. So, one or more nodes may have multi-parents. Therefore a network model allows a more natural modeling of relationship between entities. There is no superior or subordinate relationship in network model as exists in hierarchical models.

13. Which normal form is considered as adequate for usual database design?

- (a) 2 NF (b) 3 NF
(c) 4 NF (d) 5 NF

Ans (b) BCNF does not guarantee dependency preserving, but 3 NF satisfied both dependency preserving and lossless join. These are goal of database design.

So, 3 NF is considered as adequate normal form.

14. If $D_1, D_2 \dots D_n$ are domains in a relational model, then the relation is a table, which is a subset of

- (a) $D_1 + D_2 + \dots + D_n$
(b) $D_1 \times D_2 \times \dots \times D_n$
(c) $D_1 \cup D_2 \cup \dots \cup D_n$
(d) $D_1 - D_2 - \dots - D_n$

Ans (b) The (x) Cartesian product operator is a binary operator to combines the tuples of the relation with all the tuples of the other relation.

The value of relation is a subset of the cartesian product (x) of D_1, D_2, \dots, D_n .

15. Which of the following addresses is used to deliver a message to the correct application program running on a host?

- (a) Port (b) IP
(c) Logical (d) Physical

Ans (a) A port number is a way to identity a specific process to which an Internet or other network message is to be forwarded when it arrives at a server. For the TCP (transmission control protocol) and UDP (user datagram protocol), a port number is a 16 bit integer that is put in the header appended to a message unit. Specific port numbers are often used to identity specific services.

16. In _____ substitution, a character in the plaintext is always changed to the same character in the ciphertext, regardless of its position in the text.
- (a) polyalphabetic (b) monoalphabetic
(c) transpositional (d) multialphabetic

Ans (b) In monoalphabetic substitution, a character (or a symbol) in the plain text is always changed to the same character (or symbol) in ciphertext regardless of its position in the text. In other words, the relationship between letters in the plaintext and the ciphertext is one to one.

Whereas polyalphabetic is one to many.

17. In classful addressing, the IP address 190.255.254.254 belongs to
- (a) Class A (b) Class B
(c) Class C (d) Class D

Ans (b) Range of IPv4 addresses:

Class	Range (First octet in Decimal)	First octet (from MSB)
A	1-126	0
B	128-191	10
C	192-223	110
D	224-239	1110
E	240-255	1111

So, first octet (190) of given IP address (190.225.254.254) belongs to class B.

18. In hierarchical routing with 4800 routers, what region and cluster size should be chosen to minimize the size of the routing table for a three layer hierarchy?
- (a) 10 clusters, 24 regions and 20 routers
(b) 12 clusters, 20 regions and 20 routers
(c) 16 clusters, 12 regions and 25 routers
(d) 15 clusters, 16 regions and 20 routers

Ans (d) Assume that there is one 'a' clusters, 'b' regions in each region and 'c' routers per region.

And $abc = 4800$ (all the options quality multiplications rule).

Now, the formula to minimize is

$$(a - 1) + (b - 1) + c$$

Therefore,

- (a) sums 52
(b) sums 50
(c) sums 51
(d) sums 49

So, in option (d) will have to keep minimum routing table.

19. In IPv4 header, the _____ field is needed to allow the destination host to determine which datagram a newly arrived fragments belongs to.
- (a) identification
(b) fragment offset
(c) time to live
(d) header checksum

Ans (a) 1. The **identification field** is needed to allow the destination host to determine which datagram a newly arrived fragment belongs to all the fragments of a datagram contain the same identification value.

2. **Time of live (TTL)** field is a counter used to limit packet lifetimes.

3. The **header checksum** verifies the header only.

20. Given $L_1 = L(a^*baa^*)$ and $L_2 = L(ab^*)$. The regular expression corresponding to language $L_3 = L_1/L_2$ (right quotient) is given by
- (a) a^*b (b) a^*baa^*
(c) a^*ba^* (d) None of these

Ans (c) The right quotient (or simply) quotient of a formal language L_1 with a formal language L_2 is the language consisting of strings w such that wx is in L_1 for some string x in L_2 i.e.,

$$L_1 / L_2 = \{w | \exists x ((x \in L_2) \wedge (wx \in L_1))\}$$

Since given

$$L_1 = a^*baa^* = \{ba, aba, abaa, baa, \dots\}$$

$$L_2 = ab^* = \{a, ab, abb, abbb, \dots\}$$

Therefore,

$$L_1 / L_2 = \{b, ab, ba, aba, \dots\} = (a^*ba^*)$$

we have used only string 'a' of language L_2 .

21. Given the production rules of a grammar G_1 as
- $$S_1 \rightarrow AB \mid aaB$$
- $$A \rightarrow a \mid Aa$$
- $$B \rightarrow b$$
- and the production rules of a grammar G_2 as
- $$S_2 \rightarrow aS_2bS_2 \mid bS_2aS_2 \mid \lambda$$
- Which of the following is correct statement?
- (a) G_1 is ambiguous and G_2 is not ambiguous.
(b) G_1 is ambiguous and G_2 ambiguous.
(c) G_1 is not ambiguous and G_2 is ambiguous.
(d) G_1 is not ambiguous and G_2 is not ambiguous.

Ans (b) An **ambiguous grammar** is a context free grammar for which there exists a string that can have more than one parse tree.

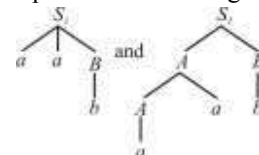
Given, grammar G_1 is

$$S_1 \rightarrow AB \mid aaB$$

$$A \rightarrow a \mid Aa$$

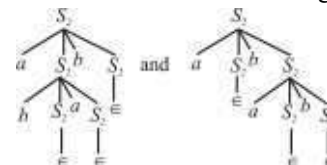
$$B \rightarrow b$$

G_1 can have two parse tree for string $w = aab$.



Grammar G_2 is $S_2 \rightarrow aS_2bS_2 \mid bS_2aS_2 \mid \epsilon$

G_2 can have two derivation tree for string $w = abab$.



Both grammar G_1 and G_2 are ambiguous grammar.

22. Given a grammar: $S_1 \rightarrow Sc, S \rightarrow SA \mid A, A \rightarrow aSb \mid ab$, there is a rightmost derivation $S_1 \Rightarrow Sc \Rightarrow SAC \Rightarrow SaSbc$.

Thus, $SaSbc$ is a right sentential form, and its handle is

- (a) SaS (b) bc
(c) Sbc (d) aSb

Ans (d)

$SaSbc$
 $Sac [A \rightarrow aSb]$
 $Sc[S \rightarrow SA]$
 $S_1[S_1 \rightarrow Sc] \Rightarrow aSb$

23. The equivalent production rules corresponding to the production rules $S \rightarrow S\alpha_1 \mid S\alpha_2 \mid \beta_1 \mid \beta_2$ is

- (a) $S \rightarrow \beta_1 \mid \beta_2, A \rightarrow \alpha_1 A \mid \alpha_2 A \mid \lambda$
(b) $S \rightarrow \beta_1 \mid \beta_2 \mid \beta_1 A \mid \beta_2 A, A \rightarrow \alpha_1 A \mid \alpha_2 A$
(c) $S \rightarrow \beta_1 \mid \beta_2, A \rightarrow \alpha_1 A \mid \alpha_2 A$
(d) $S \rightarrow \beta_1 \mid \beta_2 \mid \beta_1 A \mid \beta_2 A, A \rightarrow \alpha_1 A \mid \alpha_2 A \mid \lambda$

Ans (d) $S \rightarrow S\alpha_1 \mid S\alpha_2 \mid \beta_1 \mid \beta_2$

Left factoring the given grammar gives.

$S \rightarrow \beta_1 \mid \beta_2 \mid A\beta_1 \mid A\beta_2$.

$A \rightarrow \alpha_1 A \mid \alpha_2 A \mid \lambda$

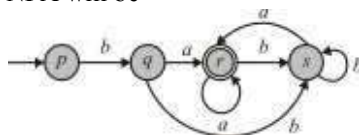
24. Given a Non-deterministic Finite Automation (NFA) with states p and r as initial and final states respectively and transition table as given below:

	a	b
p	—	q
q	r	s
r	r	s
s	r	s

The minimum number of states required in Deterministic Finite Automation (DFA) equivalent to NFA is

- (a) 5 (b) 4
(c) 3 (d) 2

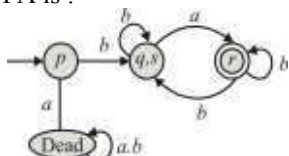
Ans (b) NFA will be



Transition table of DFA will be

	a	b
$\rightarrow p$	Dead	q
q	r	s
r	r	s
s	r	s
Dead	Dead	Dead

We can merge state q and s as same transition. So, required DFA is :



25. Which is the correct statement(s) for Non Recursive predictive parser?

S_1 : First (α) = $\{t \mid \alpha \Rightarrow t\beta \text{ for some string } \beta\} \Rightarrow t\beta$

S_2 : Follow (X) = $\{a \mid S \Rightarrow aXa\beta \text{ for some string } \alpha \text{ and } \beta\}$

- (a) Both statements S_1 and S_2 are incorrect.
(b) S_1 is incorrect and S_2 is correct.
(c) S_1 is correct and S_2 is incorrect.
(d) Both statements S_1 and S_2 are correct.

Ans (d) We associate each grammar symbol A with the first (A). The implication of this set is that the grammar symbol A can in some steps of transition produce the elements of the set first (A).

Follow is defined only for non-terminals of the grammar G. It can be defined as the set of terminals of grammar G. which can immediately follow the non-terminal in a production rule from start symbol.

Both statements are true.

26. Given an open address hash table with load factor $\alpha < 1$, the expected number of probes in a successful search is

- (a) Atmost $\frac{1}{\alpha} \ln \left(\frac{1-\alpha}{1} \right)$
(b) Atmost $\frac{1}{\alpha} \ln \left(\frac{1}{1-\alpha} \right)$
(c) Atmost $\frac{1}{\alpha} \ln \left(\frac{1}{1-\alpha} \right)$
(d) Atmost $\frac{1}{\alpha} \ln \left(\frac{\alpha}{1-\alpha} \right)$

Ans (b) Theorem: Given an open address hash table with load factor $\alpha = n/m < 1$, the expected number of probes in an unsuccessful and a successful search are at most $1/(1-\alpha)$ and $(1/\alpha) \ln(1/(1-\alpha))$ respectively.

Assuming uniform hashing and assuming that each key in the table is equally likely to be searched for.

27. For a B-Tree of height h and degree t, the total CPU time used to insert a node is

- (a) $O(h \log t)$ (b) $O(t \log h)$
(c) $O(t^2 h)$ (d) $O(th)$

Ans (d) Inserting a key K into a B-tree T of height h is done in a single pass down tree, requiring $O(h)$ disk accesses. The CPU time required is $O(t.h) = O(t \cdot \log_t(n))$.

28. The time complexity to build a heap with a list of n-numbers is

- (a) $O(\log n)$ (b) $O(n)$
(c) $O(n \log n)$ (d) $O(n^2)$

Ans (b) The time complexity of build heap tree procedure is $O(n)$.

29. The value of postfix expression:

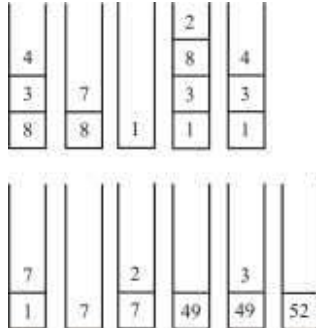
834 + - 382 / + × 2 \$ 3 + is

- (a) 17 (b) 131
(c) 64 (d) 52

Ans (d) Given, postfix expression is

8 3 4 + - 3 8 2 / + * 2 \$ 3 +

Evaluation of postfix expression using operand stack is



30. Consider the following statements for priority queue :

S₁: It is data structure in which the intrinsic ordering of the elements does determine the result of the elements does determine the result of its basic operations.

S₂: The elements of a priority queue may be complex structures that are ordered on one or several fields.

Which of the following is correct?

- (a) Both S₁ and S₂ are correct.
(b) S₁ is correct and S₂ is incorrect.
(c) S₁ is incorrect and S₂ is correct.
(d) Both S₁ and S₂ are correct.

Ans (d) 1. A **priority queue** is a data structure in which the intrinsic ordering of the elements determines the results of its basic operations.

2. There are two types of priority queues: **ascending order** and **descending order** priority queues. The elements of a priority queue need not be numbers or characters that can be compared directly. They may be complex structures that are ordered on one or several fields.

31. Repository of information gathered from multiple sources, storing under unified scheme at a single site is called as.

- (a) Data mining (b) Meta data
(c) Data warehousing (d) Database

Ans (c) 1. A **data warehouse** is constructed by integrating data from multiple heterogeneous sources. It supports analytical reporting, structured and/or adhoc queries and decision making.

2. **Collections of database** that work together are called data warehouses. This makes in possible to integrate data from multiple database.

3. **Data mining** is used to help individuals and organizations make better decisions. Meta data is data that describes other data.

32. The task of correcting and pre processing data is called as

- (a) Data streaming (b) Data cleaning
(c) Data mining (d) Data storming

Ans (b) **Data scrubbing**, also called data cleansing is the process of amending or removing data in a database that is incorrect, incomplete, improperly formatted, or duplicated.

33. Using data $p = 3$, $q = 11$, $n = pq$, $d = 7$ in RSA algorithm find the cipher text of the given plain text SUZANNE:

- (a) BUTAEEZ (b) SUZANNE
(c) XYZABCD (d) ABCDXYZ

Ans (a) Given, $P = 3$, $q = 11$, $d = 7$, $n = 33$.

Therefore, using RSA algorithm

$$\phi(n) = (P-1)(q-1) = 2 \times 10 = 20$$

and $ed \equiv 1 \pmod{\phi(n)}$

$$G(1)(e, \phi(n)) = 1$$

so, $e = 3$, $d = 7$

Now, $a = 1$, $b = 2$, $c = 3$, $z = 26$

Given SUZANNE = 19, 21, 26, 1, 14, 14, 5

Since, $m' = m^e \pmod{N}$.

So,

$$\Rightarrow 19^3 \pmod{33} = 28 \text{ (i.e., } 28 - 26 = 2) \\ = 2 \Rightarrow B$$

$$\Rightarrow 21^3 \pmod{33} = 21 \Rightarrow U$$

$$\Rightarrow 26^3 \pmod{33} = 20 \Rightarrow T$$

$$\Rightarrow 1^3 \pmod{33} = 1 \Rightarrow A$$

$$\Rightarrow 14^3 \pmod{33} = 5 \Rightarrow E$$

$$\Rightarrow 5^3 \pmod{33} = 26 \Rightarrow Z$$

Therefore ciphertext is BUTAEEZ.

34. The relation "divides" on a set of positive integers is _____.

- (a) Symmetric and transitive
(b) Anti symmetric and transitive
(c) Symmetric only
(d) Transitive only

Ans (b) 1. A relation R on a set A is called antisymmetric if and only if for any a and b in A , whenever $(a, b) \in R$ and $(b, a) \in R$ then $a = b$ must hold.

2. Since, a/b and b/a is true if and only if $a = b$ then the relation satisfies the property of being antisymmetric.

3. A relation R on a set A is called transitive if $(a, b) \in R$ and $(b, c) \in R$ the $(a, c) \in R$ must hold.

4. If a/b and b/c hold then a/c also hold so, given relation is antisymmetric and transitive.

35. Give as good a big- O estimate as possible for the following functions:

$$(n \log n + n^2) (n^3 + 2) \text{ and}$$

$$(n! + 2^n) (n^3 + \log(n^2 + 1))$$

- (a) $O(n^5 + 2n^2)$ and $O(n^3 \times n!)$
(b) $O(n^5)$ and $O(n^3 \times 2^n)$

- (c) $O(n^5)$ and $O(n^3 \times n!)$
 (d) $O(n^5 + 2n^2)$ and $O(n^3 \times 2^n)$

Ans (c) Let f and g be two functions defined on some subset of the real numbers one writes $f(x) = O(g(x))$ as $x \rightarrow 0$. If and only if there is a positive constant m such that for all sufficiently large value of x . In other words

$$\Rightarrow |f(x)| \leq m|g(x)| \forall x \geq x_0$$

$$\Rightarrow f(x) = O(g(x))$$

$$\Rightarrow \lim_{n \rightarrow \infty} \frac{f(x)}{g(n)} = 0$$

36. A test contains 100 true/false questions. How many different ways can a student answer the questions on the test, if the answer may be left blank also.

- (a) $^{100}P_2$ (b) $^{100}C_2$
 (c) 2^{100} (d) 3^{100}

Ans (d) There is three options of each question, i.e., either answer true or answer false or leave it blank. So, total number of answering the test.

$$= 3 \times 3 \times 3 \times \dots \times (100 \text{ times}) = 3^{100}$$

37. Which of the following connected simple graph has exactly one spanning tree?

- (a) Complete graph (b) Lord Harvey
 (c) Thomas Shadwell (d) Joseph Addison

Ans (d) A connected simple graph has unique spanning tree only if graph edges have distinct edge weights.

38. How many edges must be removed to produce the spanning forest of a graph with N vertices, M edges and C connected components?

- (a) $M + N - C$ (b) $M - N - C$
 (c) $M - N + C$ (d) $M + N + C$

Ans : (c) $[M - N + C]$ edges must be remove to produce to spanning fastest of a graph with ' N ' vertices.

39. Which of the following shall be a compound proposition involving the propositions p , q and r , that is true when exactly two of the p , q and r are true and is false otherwise?

- (a) $(p \vee q \wedge \neg r) \vee (p \wedge q \vee r) \wedge (\neg p \wedge q \vee r)$
 (b) $(p \wedge q \vee r) \wedge (p \wedge q \wedge r) \vee (\neg q \wedge \neg p \wedge \neg r)$
 (c) $(p \wedge q \wedge \neg r) \vee (p \wedge \neg q \wedge r) \vee (\neg p \wedge q \wedge r)$
 (d) $(p \vee r \wedge q) \vee (p \wedge q \wedge r) \vee (\neg p \wedge q \wedge r)$

Ans : (c) Draw the truth table of boolean function that involves p , q and r that is true when exactly two of the p , q and r are true and is false otherwise.

p	q	r	f
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

Therefore,

$$f = (\neg p \wedge q \wedge r) \vee (p \wedge \neg q \wedge r) \vee (p \wedge q \wedge \neg r)$$

40. The truth value of the statements:

$$\exists! x P(x) \rightarrow \exists x P(x) \text{ and } \exists! x \neg P(x) \rightarrow \neg \forall x P(x)$$

(Where the notation $\exists! x P(x)$ denotes the proposition "There exists a unique x such that $P(x)$ is true") are:

- (a) True and False (b) False and True
 (c) False and False (d) True and True

Ans : (d) (i) If there exists a unique x with $p(x)$ true, then there exist an x with $p(x)$ true. This is true as exactly one is a subset of at least one.

(ii) If there exists a unique x with $p(x)$ false, then there exist an x with $p(x)$ false. This is also true since exactly one is a subset of atleast one and $\neg \forall x p(x) = \exists x \neg p(x)$.

41. How many different Boolean functions of degree 4 are there?

- (a) 2^4 (b) 2^8
 (c) 2^{12} (d) 2^{16}

Ans : (d) Total number of boolean functions with total 2^n

$$\text{Combinations} = 2^{2^n}$$

Given, $n = 4$, therefore,

$$\text{Number of boolean functions} = 2^{2^4} = 2^{16}$$

42. A Boolean operator θ is defined as follows:

$$1\theta 1 = 1, 1\theta 0 = 0, 0\theta 1 = 0 \text{ and } 0\theta 0 = 1$$

What will be the truth value of the expression $(x \theta y) \theta z = x \theta (y \theta z)$?

- (a) Always false
 (b) Always true
 (c) Sometimes true
 (d) True when x, y, z are all true

Ans : (b) $(xy + \bar{x}\bar{y}) = x\theta y$ always true.

43. Which one of the following is decimal value of a signed binary number 1101010, if it is in 2's complement form?

- (a) -42 (b) -22
 (c) -21 (d) -106

Ans : (b) If MSB (most significant bit) of 2's complement representation is 1 then number is negative (magnitude is 2's complement) else number is positive itself.

Since MSB of given 2's complement representation is 1, so, given number is negative and its magnitude is:

$$\Rightarrow 2's \text{ complement of } 1101010$$

$$\Rightarrow 0010101 + 1 = (0010110)_2$$

$$\Rightarrow (22)_{10}$$

So, number is - 22.

44. A set of processors P_1, P_2, \dots, P_k can execute in parallel if Bernstein's conditions are satisfied on a pairwise basis; that is $P_1 \parallel P_2 \parallel P_3 \dots \parallel P_k$ if and only if:

- (a) $P_i \parallel P_j$ for all $i \neq j$
- (b) $P_i \parallel P_j$ for all $i = j + 1$
- (c) $P_i \parallel P_j$ for all $i \leq j$
- (d) $P_i \parallel P_j$ for all $i \geq j$

Ans : (a) A set of processes can execute in parallel if Bernstein's conditions are satisfied on a pair wise basis; that is $P_1 \parallel P_2, \dots, P_k$ if and only if $P_i \parallel P_j$ for all $i \neq j$.

45. When a mobile telephone physically moves from one of the another cell, the base station transfers ownership to the cell getting strongest signal. This process is known as _____.

- (a) handoff
- (b) mobile switching
- (c) mobile routing
- (d) cell switching

Ans : (a) In a cellular telephone network, handoff is the transition for any given user of signal transmission from one base station to a geographically adjacent base station as the user moves around.

46. A virtual memory based memory management algorithm partially swaps out a process. This is an example of

- (a) short term scheduling
- (b) long term scheduling
- (c) medium term scheduling
- (d) mutual exclusion

Ans : (c) Medium term scheduling is a part of swapping. It removes the processes from the memory. It reduces the degree of multiprogramming. The medium term scheduler is in charge of handling the swapped-out processes.

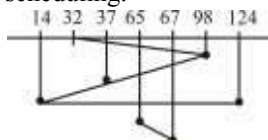
A long term scheduler determines which program are admitted to the system for processing. It select processes from the queue and load them into memory for execution.

The short-term scheduler decides which of the ready, in-memory processes is to be executed after a clock interrupt, an I/O interrupt, an operating system call, or another form of signal.

47. Assuming that the disk head is located initially at 32, find the number of disk moves required with FCFS if the disk queue of I/O block requests are 98, 37, 14, 124, 65, 67:

- (a) 310
- (b) 324
- (c) 320
- (d) 321

Ans : (d) Given request is: 98, 37, 14, 124, 65, 67
Using FCFS (first come first serve) disk scheduling.



So, total number of disk moves:
= $66 + 84 + 110 + 59 + 2 = 321$

48. Let the page fault service time be 10 millisecond (ms) in a computer with average memory access time being 20 nanosecond (ns). If one page fault is generated for every 10^6 memory accesses, what is the effective access time for memory?

- (a) 21 ns
- (b) 23 ns
- (c) 30 ns
- (d) 35 ns

Ans : (c) Given, page fault service time (c) = 10 msec
= 10×10^6 n sec

Memory access time (m) = 20 nsec

Pagefault rate = $1/10^6$

Therefore,

$$\text{EMAT} = \frac{1}{10^6} \times 10 \times 10^6 + \left(1 - \frac{1}{10^6}\right) \times 20$$

$$= 10 + 20 - \frac{20}{10^6} \Rightarrow 30 \text{ n sec}$$

49. Consider the following UNIX command:

sort <in> temp; head - 30 <temp; rm temp

Which of the following functions shall be performed by this command?

- (a) Sort, taking the input from "temp", prints 30 lines from temp and delete the file temp
- (b) Sort the file "temp", removes 30 lines from temp and delete the file temp
- (c) Sort, taking the input from "in" and writing the output to "temp" then prints 30 lines from temp on terminal. Finally "temp" is removed.
- (d) Sort, taking the input from "temp" and then prints 30 lines from "temp" on terminal. Finally "temp" is removed.

Ans : (c) Sort, taking the input from "in" and writing the output to "temp" then prints 30 lines from temp on terminal. Finally "temp" is removed.

50. The mv command changes

- (a) the inode
- (b) the inode-number
- (c) the directory entry
- (d) both the directory entry and the inode

Ans : (c) mv (short for move) is a Unix command that moves one or more files or directories from one places to another. If both filenames are on the same file system, this results in a simple file rename, otherwise the file content is copied to the new location and the old file is removed.

Using mv requires the user to have write permission for directories the file will move between. This is because mv changes the content of both directories (i.e., the source and the target) involved in the move. The files 'i'-number (short for "i-node number") does not change.