2023-24

ENGLISH MEDIUM

GENERAL ENGINEERING

CHAPTERWISE SOLVED PAPER

Youth Competition Times

GENERAL ENGINEERING

JSSC JE/JDLCCE/BPSC AE/APSC AE

APPSC AE/IERL JE/
RSMSSB JEN
(DIPLOMA) E&M
RSMSSB JEN (Degree)
E&M/DSSSB AE/
JE (E&M)/MPSC Pre
DDA E&M/
UP JAL NIGAM/
NHPC JE

5604 OBJECTIVE QUESTIONS

83 PAPERS

CHAPTERWISE

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AS PER REVISED ANSWER-KEY

ANSWER WITH DETAIL ANALYTICAL EXPLANATION

ANSWER WITH DETAIL ANALYTICAL EXPLANATION

GENERAL ENGINEERING

Part A : Basic of Civil Engineering
Part B: Basic of Electrical & Electronics Engineering
Part C : Basic of Mechanical Engineering

Useful for- JSSC JE/ JDLCC JE/ BPSC AE/ MPSC AE/APPSC AE/ IERL JE/ RSMSSB JEN (Diploma) E & M RSMSSB JEN (Degree) E & M/ DSSSB AE/JE (E&M)/ MPSC Pre/DDA E&M/UP JAL NIGAM NHPC JE/ BHEL

Chapterwise Solved Papers

Chief Editor
Mr. Anand Mahajan

Compiled & Written by
YCT Engineering Expert Teams

Editorial Office
12, Church Lane Prayagraj-211002

Mob : 9415650134

Email : yctap12@gmail.com

website : www.yctbooks.com/ www.yctfastbooks.com

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Rs. : 1395/-

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PART- A : BASIC OF CIVIL ENGINEERING

PART- B : BASIC OF ELECTRICAL & ELECTRONICS ENGINEERING

PART- C : BASIC OF MECHANICAL ENGINEERING

GENERAL ENGINEERING SYLLABUS

Civil Engineering Part A -Building Materials, Estimating, Costing and valuation, Surveying, Soil Mechanics, Hydraulics, Irrigation Engineering, Transportation Engineering, Environmental Engineering. Structural Engineering- Theory of Structures, Concrete Technology, RCC Design, Steel Design.

Electrical Engineering Part B - Basic concepts, Circuit law, Magnetic circuit, AC fundamentals, Measurement and Measuring Instruments, Electrical Machines, Fractional Kilowatt Motors and single phase induction Motors, ynchronous Machines, Generation, Transmission and Distribution, Estimation and Costing, Utilization and Electrical Energy, Basic Electronics.

Mechanical Engineering Part C- Theory of Machines and Machine Design, Engineering Mechanics and Strength of Materials, Properties of pure substances, 1st. Law of Thermodynamics, 2nd. Law of Thermodynamics, Air standard cycle for IC Engines, IC Engine performance, IC Engine Combustion, IC Engine Cooling & Lubrication, Rankine cycle of System, Boilers, Classification, Specification, Fitting and Accessories, Air Compressor and their cycles, Refrigeration cycles , Principle of Refrigeration Plant, Nozzles and Steam Turbines. Properties & Classification of Fluids, Fluid Statics, Measurement of Fluid Pressure, Fluid Kinematics, Dynamics of ideal fluids, Measurement of Flow rate basic principles, Hydraulic Turbines, Centrifugal Pumps. Classification of steels.

General Engineering JE/AE Previous Years Papers Analysis Chart

S.No.	EXAM NAME	EXAM DATE	No. of Questions
Jharkhand Staff Selection Commission (JSSC)			
1.	JSSC JE (General Engg.)	23.10.2022	**1×80**
2.	JSSC JE (General Engg.)	03.07.2022	**1×80**
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5.	JSSC JE (General Engg.)	04.11.2022	**1×80**
6.	JSSC JE (General Engg.)	2017	**1×120**
7.	JPSC AE (General Engg.)	2013	**1×50**
Bihar Public Service Commission (BPSC)			
8.	BPSC AE (General Engg.)	14.10.2022	**1×50**
9.	BPSC AE (General Engg.)	11.11.2022	**1×50**
10.	BPSC AE (General Engg.)	13.03.2022	**1×50**
11.	BPSC AE (General Engg.)	25.03.2022	**1×50**
12.	BPSC AE (Civil)	14.10.2022	**1×50**
13.	BPSC AE (Civil)	25.03.2022	**1×50**
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16.	BPSC AE (Civil)	30.03.2019	**1×50**
17.	BPSC AE (General Engg.)	15.09.2018	**1×50**
18.	BPSC AE (General Engg.)	16.09.2018	**1×50**
19.	BPSC AE (General Engg.)	03.12.2012	**1×50**
20.	BPSC AE (General Engg.)	2006	**1×50**
21.	BPSC AE (General Engg.)	2001	**1×50**
22.	BPSC AE (General Engg.)	1995	**1×50**
National Hydroelectric Power Corporation (NHPC)			
23.	NHPC JE (ME)	06.04.2022, Shift-I	**1×30**
24.	NHPC JE (ME)	06.04.2022, Shift-II	**1×30**
25.	NHPC JE (EE)	05.04.2022, Shift-I	**1×30**
26.	NHPC JE (EE)	05.04.2022, Shift-II	**1×30**
27.	NHPC JE (Civil)	04.04.2022, Shift-I	**1×30**
28.	NHPC JE (Civil)	04.04.2022, Shift-II	**1×30**
Rajasthan Subordinate and Ministerial Services Selection Board (RSMSSB)			
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30.	RSMSSB JE (E&M) Diploma	20.05.2022	**1×160**
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32.	RSMSSB JE (E&M) Diploma	26.12.2020	**1×160**
Maharashtra Public Service Commission (MPSC)			
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36.	MPSC AE Pre.	09.07.2017	**1×60**
Delhi Subordinate Service Selection Board (DSSSB)			
37.	DSSSB AE (E&M)	25.11.2022	**1×160**
38.	DSSSB AE (E&M)	21.03.2022 Shift-I	**1×100**
39.	DSSSB AE (E&M)	21.03.2022 Shift-II	**1×61**
40.	DSSSB AE (E&M)	08.03.2022 Shift-I	**1×69**
41.	DSSSB AE (E&M)	08.03.2022 Shift-II	**1×73**
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Delhi Development Authority (DDA)			
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60.	RRB JE 2015	16.09.2015 Shift-III	**1×61**
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62.	RRB JE (Ranchi) 2015	04.01.2015	**1×68**
63.	RRB JE (Ranchi) 2015	04.01.2015	**1×62**
64.	RRB JE (Bilaspur/Kolkata/Mumbai/Guwahati) 2014	14.12.2014	**1×39**
65.	RRB JE (CHENNAI) 2014	14.12.2014	**1×56**
66.	RRB JE (Bilaspur/Guwahati/Patna) 2014	14.12.2014	**1×59**
67.	RRB JE (Muzaffarpur) 2014	14.12.2014	**1×50**
68.	RRB JE (Bilaspur/Guwahati) 2014	14.12.2014	**1×62**
69.	RRB JE (Patna/Muzaffarpur/Chennai/Ahmedabad/ Bangalore) 2014	14.12.2014	**1×59**
70.	RRB S.S.E. 2015	01.09.2015 Shift-II	**1×56**
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72.	RRB S.S.E. 2015	02.09.2015 Shift-I	**1×63**
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75.	RRB S.S.E. 2015	03.09.2015 Shift-I	**1×63**
76.	RRB S.S.E. 2015	03.09.2015 Shift-II	**1×68**
77.	RRB S.S.E. 2015	03.09.2015 Shift-III	**1×65**
78.	RRB S.S.E. (Bilaspur/Secunderabad) 2014	21.12.2014	**1×59**
79.	RRB S.S.E. (Bilaspur/Secunderabad) 2014	21.12.2014	**1×57**
80.	RRB S.S.E. (Bilaspur/Secunderabad) 2014	21.12.2014	**1×60**
81.	RRB S.S.E. (Bhopal) 2014	21.12.2014	**1×44**
82.	RRB S.S.E. (Secunderabad) 2014	01.09.2015	**1×61**
Others			
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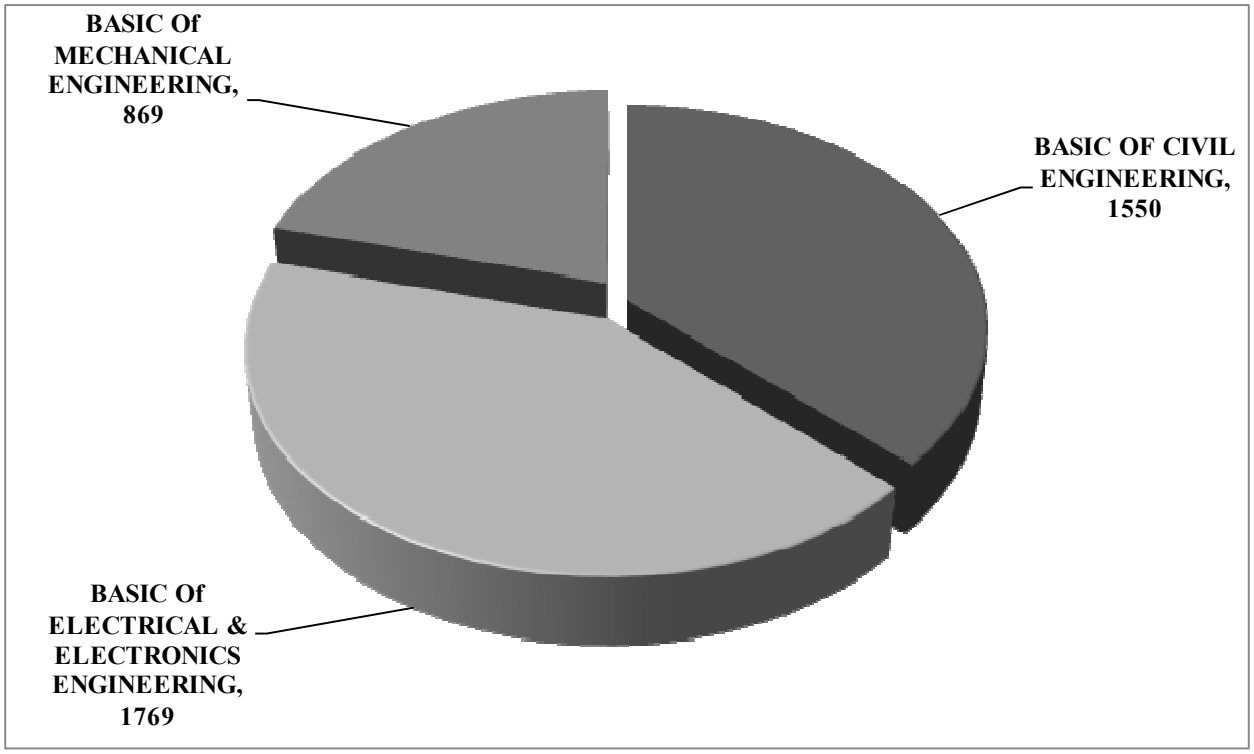
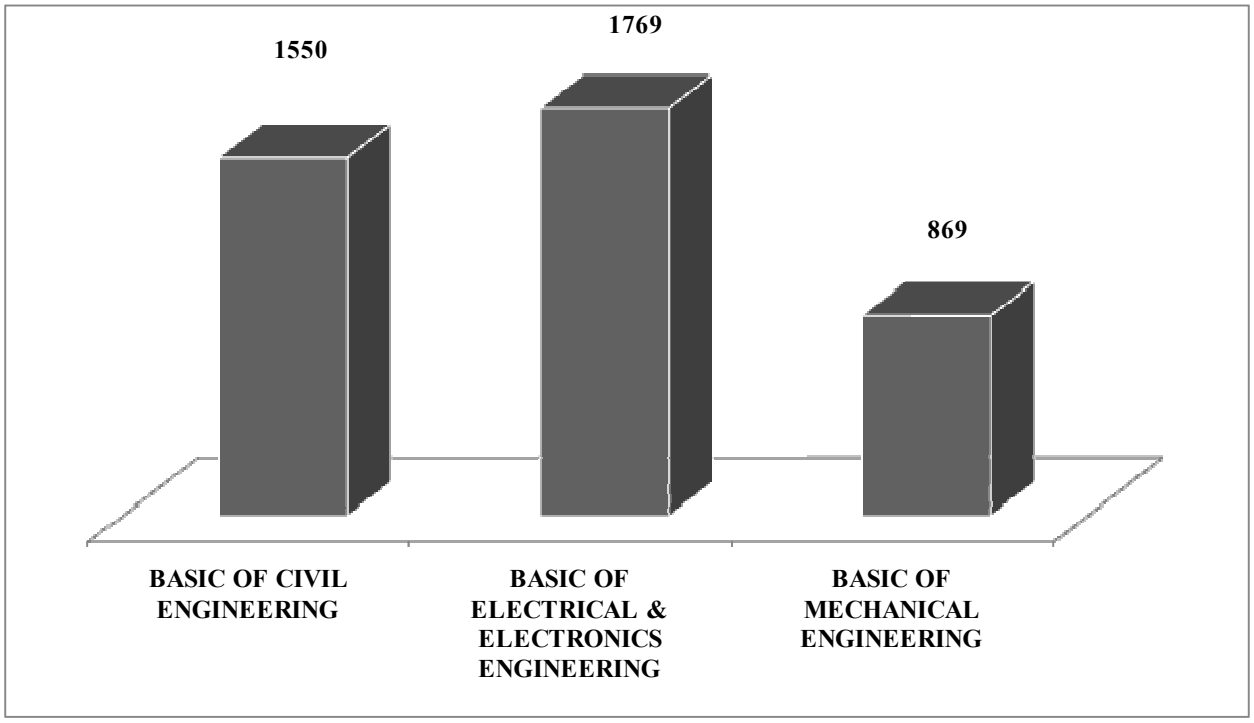
84.	APPSC AE Pre.	15.05.2022	**1×150**
85.	UP Jal Nigam JE (E&M)	16.12.2016	**1×60**
		Total	**5604**

Trend Analysis of Previous Year Papers

Through Pie Chart and Bar Graph





PART- A

BASIC CIVIL ENGINEERING

01.

Building Material

1. The maximum working temperature of Nickel chromium is about:

(a) 1150°C (b) 1500°C

(c) 1000°C (d) 1400°C

NHPC JE (ME) 06.04.2022 (Shift-II)

Ans. (a) : The maximum working temperature of Nickel chromium is about 1150°C, melting point 1400°C, specific gravity 8.4 gm/cm^3 and high resistance to oxidation.

2. Which of the following is NOT a grade of cement as per IS classification ?

(a) Ordinary Portland cement (OPC) 23

(b) Ordinary Portland cement (OPC) 53

(c) Ordinary Portland cement (OPC) 33

(d) Ordinary Portland cement (OPC) 43

NHPC JE (Civil) 04.04.2022 (Shift-II)

Ans. (a) : Classification of cement–

1. 33 grade OPC; IS-269 of 1989
2. 43 grade OPC; IS-8112 of 1989
3. 53 grade OPC; IS-12269 of 1987

3. According to IS 2222 (1991): 'Specification for burnt clay perforated building bricks', the area of each perforated in the perforated bricks shall not exceed_____cm^2.

(a) 50.00 (b) 0.50

(c) 500.00 (d) 5.00

JSSC JE (GEN. ENGG.) 04.11.2022

Ans. (d) : Specification for perforated burnt clay building bricks (IS 2222-1991)

• Bricks shall be free from cracks and flows and nodules of free lime.

• Bricks shall be of uniform in colour and texture.

• The area of perforation shall be in between 30% to 45% of the total area of the corresponding face of the bricks.

• The shorter side of the perforation shall be less than 20 mm in case of rectangular perforation and less than 25 mm diameter in case of circular perforations.

• Area of each perforation shall not exceed 500 mm^2 or 5 cm^2

• Thickness of any shell shall not be less than 15 mm and that of any web not less than 10 mm

• Average compressive strength shall not be less than 7 N/mm^2 on net area

• Water absorption shall not be more than 20% by weight

• Average warpage shall not exceed 3%.

4. According to Indian standards, what is the safe bearing capacity of rocks without laminations and defects useful for laying foundation?

(a) 330 t/m^2 (b) 430 t/m^2

(c) 130 t/m^2 (d) 230 t/m^2

JSSC JE (GEN. ENGG.) 04.11.2022

Ans. (a) : Recommended values of safe bearing capacity for preliminary analysis

SI. No	Type of rock or soil	Safe bearing capacity	
		kN/m^2	kg/cm^2
	Rocks		
1.	Rocks (hard) without lamination and defects, for example granite trap and diorite	3300	33
2.	Laminated rocks, for example sand stone and lime stone in sound condition	1650	16.5
3.	Residual deposits of shattered and broken bed rock and hard shale, cement material	900	9
4.	Soft rock	450	4.5
	Non-cohesive soil		
5.	Gravel, sand and gravel mixture compact and offering high resistance to penetration when excavated by tools	450	4.5
6.	Coarse sand compact and dry (with ground water level at a depth greater than width of foundation below the base of footing)	450	4.5
7.	Medium sand, compact and dry	250	2.5
8.	Fine sand, silt (dry lumps easily pulverised by bingers)	150	1.5
9.	Fine sand, loose and dry	100	1.0

5. Which of the following is used as an organic solvent preservative in the process of preservation of timber?

(a) Creosote

(b) Copper naphthenate

(c) Solignum

(d) Carbolinium

JSSC JE (GEN. ENGG.) 04.11.2022

Ans. (b): Preservation of timber–In order to protect the timber from attacks of insects, chemical preservative are used to increase the life of the wood.

Types of preservatives–

Tar oils–It is used to rough types of work. Creasote is most commonly used and various creasotes are cool tar, wood tar and water gas etc.

Water soluble preservatives (chemical salts)– These are odourless organic or inorganic salts and are adopted for inside location only this type of preservative are zinc chloride, boric acid, sodium fluoride etc.

Organic solvent preservatives– There are costlier than other preservatives. The common used organic solvent preservatives are nepthal and phenol (DDT) etc.

6. What should be the penetrating power of a good timber preservative?

(a) 2 mm to 6 mm
(b) 6 mm to 25 mm
(c) 25 mm to 35 mm
(d) 35 mm to 40 mm

JSSC JE (GEN. ENGG.)- 31.10.2022

Ans.(b) : Properties of good preservative for timber–

• It should be effortlessly and cheaply available.
• It should not contain any harmful substances, gases etc.
• It should be economical.
• Decorative treatment should be allowed on timber after the application of preservative.
• It should not contain any unpleasant smell.
• It should not generate flame when contacts with fire.
• The depth of penetration of preservative in wood fibers should be minimum 6 mm to 25 mm.

7. How many days does it take for Rapid Hardening Cement to develop the same strength as that is expected of Ordinary Portland Cement at 7 days?

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

JSSC JE (GEN. ENGG.)- 31.10.2022

Ans. (c) : Rapid Hardening Cement (IS 8041-1990)

This cement is similar to ordinary portland cement. It develops strength rapidly and as such it may be more appropriate to call it as high early strength cement. Rapid hardening cement develops at the age of 3 days the same strength so that is expected of OPC at 7 days.

The rapid rate of development of strength is attributed to the higher fineness of grinding and higher C_3S and lower C_2S content.

The use of rapid hardening cement is recommended in the following situations–

• In pre-fabricated concrete construction
• Road repair works
• In cold weather concrete where the rapid rate of development of strength reduces the vulnerability of concrete to the frost damage.

8. What is the purpose of using vehicle components in paint manufacturing?

(a) To prevent shrinkage and cracking
(b) To bring down the cost of paint
(c) To spread the paint evenly
(d) To modify the weight of paint

JSSC JE (GEN. ENGG.)- 31.10.2022

Ans. (c) : Vehicle

It is also known as binder. Vehicle is an oil to which the base is mixed. It holds the constituents of paint in suspension and helps spread it over the surface to be painted, imparts durability, toughness and water proofness to the paint film and resistance to weathering and gloss to the painted surface and forms the body of paint.

The purpose of using vehicle is components in paint manufacturing to spread the paint evenly.

9. The type of aggregate surface texture characteristics carried by Pumice and trass is :

(a) glassy (b) crystalline
(c) honeycombed and porous
(d) granular

JSSC JE (GEN. ENGG.)-23.10.2022

Ans. (c) : Surface texture characteristics of the aggregate as classified in IS: 383-2016 is shown below

Group	Surface texture	Examples
1.	Glassy	Black flint
2.	Smooth	Chert, slate, marble, some rhyolite
3.	Granular	Sandstone, oolites
4.	Crystalline	**Fine :** Basalt, trachyte, M**edium:** Dolerite granophyres, granulites, micro-granite, some limestones, many dolomites. **Coarse :** gabbro; gneiss, granite, granodiorite, syenite
5.	Honey combed and porous	Scoria, pumice, trass

10. White cement manufacturing needs higher firing temperature up to :

(a) 1650^0C (b) 1850^0C
(c) 1950^0C (d) 1750^0C

JSSC JE (GEN. ENGG.)-23.10.2022

Ans. (a) : White cement (IS 8042) – It is manufactured from pure white chalk and clay free from iron oxide, grayish colour of cement is due to iron oxide.

• Loss on ignition of white cement is nil.
• The compressive and transverse strength of this cement is 90% of that of 33 grade ordinary Portland cement.

11. Which of the following paints are essentially a dispersion of rubber like resin polystyrene and polyvinyl acetate in water and are prepared by grinding suitable pigments (titanium oxide) in an emulsion of water and film forming driver e.g. Co and Mn?

(a) Cellulose paint
(b) Cement based paint
(c) Rubber based paint
(d) Plastic emulsion paint

JSSC JE (GEN. ENGG.)-23.10.2022

Ans. (d) : Plastic emulsion paint (IS : 5411 Parts I and II)

• In the former case of emulsifying agents are sodium or ammonium soaps whereas in the later case metallic soaps of magnesium or zinc are used.

• Stabilizers such as proteins (dextrin, starch, casein) are added to impart chemical resistance to the emulsion.

• These paints should become surface dry within 15 minutes and hard dry within 4 hours and are alkali resistant.

• Plastic emulsion points are useful in porous and wet surface.

Rubber based paints–Rubber treated with chlorine gas is dissolved in solvent and desired pigment is added. These paints are resistant to acid, alkali and dampness. Rubber based paints are used over concrete and cement plastered surfaces.

12. What should be the percentage of Alumina in Good Brick Earth?

(a) 45% - 50% (b) 40% - 45%
(c) 20% - 30% (d) 25% - 35%

JSSC JE (GEN. ENGG.)-23.10.2022

Ans. (c) : Composition of Good Brick Earth

• Properties of various ingredients is as below–

Silica	- 50-60%
Alumina	- 20-30%
Lime	- ⩾ 10%
Ferric oxide	- 5-6%
Magnesia	- < 1%
Alkalies	- < 10%
Carbon dioxide	- very small percentage
Sulphur trioxide	- very small percentage
Water	- very small percentage

13. Consider the following methods of preservation of timber.

1. Pressure Application
2. Brush Application
3. Dipping
4. Open Tank

Then correct sequence of these methods in the increasing order of their effectiveness is :

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

JSSC JE (GEN. ENGG.)-23.10.2022

Ans. (c) : Preservation of timber (IS : 401)

The durability of wood is decidely variable property. If well-seasoned and kept in dry place if immersed in water. Preservative treatment of timber is not support to improve its basic properties like mechanical, electrical or chemical properties.

Methods of preservation of timiber in the increasing 1. Order of their effectiveness

• Brush application (Surface application)
• Dipping (Soaking treatment)
• Open tank
• Pressure application

14. Moh's scale is used to measure which property of a stone?

NHPC JE (ME) 06.04.2022 (Shift-II)

OR

For stones, Moh's scale is used to determine

(a) toughness (b) hardness
(c) flakiness index (d) durability

JPSC AE (GEN. ENGG)-2013

Ans. (b) : Hardness– It is probably the most important properly for rapid determination of minerals. It is measured by scratching the mineral with a series of substance of known variation in hardness. It is determined by Moh's scale.

15. Match List-I (constituents of bricks) with List-II (corresponding influence) and select the correct answer using the code given below the Lists :

List-I Constituents of bricks		List-II Corresponding influence	
a.	Alumina	1.	Colour brick
b.	Silica	2.	Plasticity recovery for moulding
c.	Magnesia	3.	Reacts with silica during burning and causes particles to unite together and development of strength
d.	Limestone	4.	Preserves the form of brick at high temperature and prevent shrinkage

Code:

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

JPSC AE (GEN. ENGG)-2013

Ans. (c) :

Alumina	Plasticity recovery for moulding
Silica	Preserves the form of brick at high temperature and prevent shrinkage
Magnesia	Colour brick
Limestone	Reacts with silica during burning and causes particles to unite together and development of strength

16. Which of the following IS code that gives the ceramic tile classification and characteristics?

(a) IS 12269 : 1984 (b) IS 13712 : 1993

(c) IS 2386 : Part-I (d) IS 10262 : 2009

JSSC JE (GEN. ENGG.)- 03.07.2022

Ans. (b) : IS 13712 : 1993 gives the ceramic tile classification and characteristics.

Ceramic tiles– Thin slabs made from clays silica fluxes, colouring and other minerals raw materials, generally used as coverings for floors walls or facades.

• They are prepared by grinding, sieving, mixing, moistering etc, and are shaped by pressing extruding casting or other processes, usually at room temperature.

17. What is the range of Iron oxide present in ordinary Portland cement?

(a) 0.5 – 6% (b) 8 – 15%

(c) 17 – 25% (d) 0.5 – 1.3%

JSSC JE (GEN. ENGG.)- 03.07.2022

Ans. (a) : Ingredients present in ordinary Portland cement–

1. Calcium Oxide → 60 – 65%
2. Silica → 17 – 25%
3. Aluminium Oxide → 3 – 8%
4. Calcium Sulphate → 3 – 5%
5. Iron Oxide → 0.5 – 6%
6. Magnesium Oxide → 0.1– 4%
7. Sulphur trioxide → 1 – 3%
8. Alkalies → 0.5 – 1%

18. According to Moh's scale of hardness, the mineral with least hardness is :

(a) Gypsum or apatite

(b) Sand stone or Diamond

(c) Calcite

(d) Talc

JSSC JE (GEN. ENGG.)- 03.07.2022

Ans. (d) : Moh's scale of hardness–

(a) Talc	–	1
(b) Gypsum	–	2
(c) Calcite	–	3
(d) Fluorite	–	4
(e) Apatite	–	5
(f) Felspar	–	6
(g) Silica	–	7
(h) Topaz	–	8
(i) Corundum	–	9
(j) Diamond	–	10

19. Which of the following is not a tool used for dressing stones?

(a) Face hammer

(b) Mallet

(c) Crow chisel

(d) Point chisel

JSSC JE (GEN. ENGG.)- 03.07.2022

Ans. (b): Dressing of stone–Dressing of stone is performed to achieve following objectives–

1. To obtained desired appearance
2. To increase the properties of stone such as durability and strength.
3. To suit the requirement of stone masonry
4. To reduce the transportation and handling cost of stone.
5. Crow chisel for cutting of stone.

20. Which among the following is an incorrect option?

(a) Pith is the inner most part of tree consists of cellular tissue which is used for nourishment of tree in young age.

(b) Sapwood is outer annual rings between heartwood and cambium layers. It is the living, outermost portion of a woody stem or branch.

(c) Cambium, in plants, layer of actively dividing cells between xylem (wood) and phloem (bast) tissues that is responsible for the secondary growth of stems and roots.

(d) Annular/Annual ring test/examine is used to determine the timber defects.

JSSC JE (GEN. ENGG.)- 03.07.2022

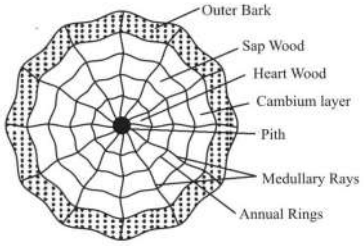
Ans. (d) : Pith–Pith is the innermost part of tree consist of cellular tissue which is used for nourishment of tree in young age.

Sap wood–It consist both living and dead cells.

• Sap wood is outer annual rings between heart wood and cambium layers, it is the living, outermost portion of a woody stem.

Cambium layer–Cambium layer is very thin layer of tissue between sapwood and inner bank.

• Cambium in plants, layer of actively dividing all between xylem (wood) and phloem (bast) that is responsible for the secondary growth of stems and roots.



21. What is the approx thickness of two and half brick wall made up of standard modular brick?

(a) 20 cm (b) 19.685 inch

(c) 30 cm (d) 23.622 inch

JSSC JE (GEN. ENGG.)- 03.07.2022

Ans. (b) : Standard size of brick = 19 cm × 19 cm × 9 cm.

Nominal size of brick with mortar = 20 cm × 10 cm × 10 cm

Non-modular brick

Conventional size of brick = 22.4 cm × 11.4 cm × 7.6 cm
Wall thickness = Thickness of modular brick + Mortar thickness
$= 2.5[19\text{ cm} + 1\text{ cm}) = 50\text{ cm}$
$= \frac{50}{2.54} = 19.685$ inch

22. The argillaceous rock has their principal constituents as
(a) Lime or Dolomite (b) Clay or Alumina
(c) Sand (SiO_2) or Dolomite
(d) Dolomite

JSSC JE (GEN. ENGG.)- 03.07.2022

Ans. (b) : The argillaceous rock has their principal constituents as clay or alumina.
Example–Granite, Gneiss, Trap, Basalt, Sand stem.

23. Which of the following will you recommend for painting internal wall?
(a) Lead oxide (b) Enamel
(c) Emulsion (d) Iron oxide

JSSC JE (GEN. ENGG.)- 03.07.2022

Ans. (c) : Emulsion paints– Two types of emulsion paints are available, one is ordinary emulsion and the other is plastic emulsion.
- The emulsion paint is easy to apply and dries quickly within $1\frac{1}{2}$ to 2 hours.
- The colour is retained for a longer period.
- The emulsion paints surface can be washed by water so this paint not use for external wall.

24. What is the function of a vehicle in an oil borne paint?
(a) It holds the ingredients of the paint in liquid suspension
(b) If forms the bulk of the paint
(c) It accelerates the process of drying
(d) It gives colour to the paint

JSSC JE (GEN. ENGG.)- 03.11.2022

Ans. (a) : Vehicle or carrier– This is a liquid substance which holds the ingredients of the paint in suspension, the most common material is linseed oil.

25. The function of adding gypsum in the manufacture of ordinary Portland cement is:
(a) to produce binding action for cement
(b) to produce quick setting of cement
(c) to prevent flash setting of cement
(d) to get a quick reaction when water is added to the cement

JSSC JE (GEN. ENGG.)- 03.11.2022

Ans. (c) : The purpose of adding gypsum is to coat the cement particles by interfering with the process of hydration of the cement particles. This retards the setting of cement.

26. As per the Bureau of Indian Standards, burnt clay bricks are classified based on their minimum average compressive strength as:
(a) 11 classes (b) 10 classes
(c) 12 classes (d) 13 classes

JSSC JE (GEN. ENGG.)- 03.11.2022

Ans. (a) : As per IS 1077 : 1992

Class Designation	Average Compressive strength Not less than (N/mm^2)
35	35.0
30	30.0
25	25.0
20	20.0
17.5	17.5
15	15.0
12.5	12.5
10	10.0
7.5	7.5
5	5.0
3.5	3.5

27. The rocks formed due to alteration of original structure under heat and excessive pressure are called-
(a) Igneous rocks
(b) Sedimentary rocks
(c) Metamorphic rocks
(d) Argillaceous rocks

JSSC JE (GEN. ENGG)-2017

Ans. (c) : Metamorphic rocks–These rocks are formed from igneous or sedimentary rocks as a result of action of the earth movements, temperature changes, liquid pressure etc.
Example–

Original rock	Metamorphic rocks
Granite	Gneiss
Sandstone	Quartzite
Limestone	Marble
Shale	Slate
Mudstone	Slate

28. Eminently hydraulic lime has
(a) no clay content
(b) about 5% clay content
(c) about 25% clay content
(d) about 60% clay content

BPSC AE (GEN. ENGG.)-2001

Ans. (c) Eminently hydraulic lime– In eminently Hydraulic lime has clayey impurities 20-30% and slakes with difficulty. Its initial setting lime is 2 hours and final setting time is 48 hours. It is used in damp places and for all structural purposes.

29. The silica in Portland cement is-
(a) 5% to 15% (b) 17 to 25%
(c) 27 to 40% (d) 42 to 60%

JSSC JE (GEN. ENGG)-2017

Ans. (b) : Different constituent of OPC

Ingredients	Quantity	Work
Lime (CaO)	62-67%	Imparts strength and soundness of the cement
Silica (SiO_2)	17.25%	It also impart strength to the cement
Alumina (Al_2O_3)	3-8%	Impart quick setting to cement
Calcium sulphate ($CaSO_4$)	3-4%	It helps in increasing the initial setting time of cement
Iron Oxide (Fe_2O_3)	3-4%	It imparts strength, hardness and colour to cement
Magnesia (MgO)	1-3%	strength, hardness and colour to cement

30. The cement, widely used in retaining wall is

(a) rapid hardening cement
(b) low heat cement
(c) sulphate resisting cement
(d) ordinary Portland cement

BPSC AE (GEN. ENGG.)-13.03.2022

Ans. (b) : Low heat cement (IS : 12600)
• It is the type of cement which involves low heat of hydration than OPC.
• Heat of hydration of this cement at the age of 7 days is not more than 65 cal/gm and at the age of 28 days is not more than 75 cal/gm.
• This cement is produced by reducing the proportion of C_3S, C_3A and increasing the proportion of C_2S.
• The cement offers higher resistance attack of sulphur and lower rate of gain of strength.
• This content finds the application in mass concreting works eg. hydraulic structures, foundation, retaining wall etc.
• Compressive strength of this cement at the age of:
3 days $\nless$ 10 N/mm^2
7 days $\nless$ 16 N/mm^2
28 days $\nless$ 35 N/mm^2
• Minimum initial setting time $\nless$ 60 minutes
• Final setting time $\ngtr$ 600 minutes.

31. Which one of the following does not belong to endogenous trees?

(a) Teak (b) Coconut
(c) Bamboo (d) Cane

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (a) : Types of trees based on growth–
(i) Exogeneous trees
Example–Chir, deodar, pine, spruce, babul, mahagony, teak, sal, oak etc.
(ii) Endogenous trees
• These are the types of trees which grows in bulk in inward direction and fibrous mass can be seen across their longitudinal section.
• Wood obtained from these tree have limited engineering application.
Example–Bamboo, cane, palm, coconut etc.

32. Alumina in brick earth gives the brick's

(a) strength
(b) colour
(c) plasticity
(d) resistance to shrinkage

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (c) : Ingredients of good brick earth–

Ingredients	Quantity
Silica	50-60%
Alumina	20-30%
Lime	2 to 5%
Iron oxides	5 to 6% $\ngtr$ 7%
Magnesia	< 1%

Alumina–
• It absorbs water and imparts plasticity to the bricks earth, have helps in its moulding.
• If it is in excess it produces cracks on drying.
• Clays have excess of alumina are likely to be very refractory.

33. Pallet board is used

(a) to make frog in the brick
(b) to mount the mould
(c) for table moulding of brick
(d) None of the above

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (c) : Table moulding– The bricks are moulded on stock boards nailed on the moulding table. Stock boards have the projection for forming the frog. The process of filling clay in the mould is the same as explained above. After this a thin board called pallet is placed over the mould. The mould containing the brick is then smartly lifted off the stock board and inverted so that the moulded clay along with the mould rests on the pallet.

34. When fat lime is slaked, its volume

(a) decreases to 50%
(b) remains same
(c) increases by 2 to 2.5 times
(d) increases by 4 times

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (c) : Fat lime or pure limes–
• Fat lime is pure lime that is made by burning a pure limestone rock like chalk, shell or coral.
• It contains approximate 90% to 95% of calcium oxides.
• Fat lime absorbs carbon dioxide when itis exposed in air and gets transferred into calcium carbonate.
• Fat lime has the following properties–
(i) Fat lime hardens very slowly.
(ii) Fat lime has very high degree of plasticity.

(iii) Fat lime slakes vigorously
(iv) Colour of fat lime is pure white
(v) Fat lime sets very slowly if exposed to air.
• Fat lime slakes rapidly when water is added giving out considerable heat and making hissing and cracking noise and increase 2 to 3 times its original volume.
• Used in white washing and plastering of wall.

35. The process of adding water to quicklime in order to convert it into hydrated lime is known as

(a) quenching (b) hydration
(c) calcination (d) slaking

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (d) : The process of adding water to quicklime in order to convert it into hydrated lime is known as slaking.

$$CaO + H_2O \longrightarrow Ca(OH)_2 + Heat$$

36. Rotary kiln used in manufacturing cement rotates at a speed of

(a) 1 r.p.m. – 3 r.p.m.
(b) 10 r.p.m. – 12 r.p.m.
(c) 18 r.p.m. – 22 r.p.m.
(d) more than 25 r.p.m.

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (a) : • A rotary kiln is a pyro-processing device used to raised materials to a high temperature (calcinations) in a continuous process.
• The rotary kiln rotates at the speed of 1-5 rpm as per the requirement of the process.

37. Match List-I with List-II and select the correct answer using the codes given below the Lists :

List-I (Parts of exogenous tree)	List-II (Character)
a. Cambium layer	1. Youngest
b. Pith	2. Innermost part
c. Heart wood	3. Thin layer of fresh sap
d. Sap wood	4. Portion surrounding pith

Codes:

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

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (b) :
Cambium layer - Thin layer of fresh sap
Pith - Innermost part
Heartwood - Portion surrounding pith
Sapwood - Youngest wood in tree

38. By calcining and smelting iron ores, a crude and impure form of iron obtained is known as

(a) cast iron (b) wrought iron
(c) steel (d) pig iron

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (d) : Pig iron–
• The iron ore in dressed by crushing it to about 50 mm cubes. The impurities are knocked off and the ore is then calcined to drive off moisture. The calcined are is smelted in blast furnace.
• Pig iron contains 3-4% carbon, 0.5-3.5% silicon, 0.5-2% manganese.

39. The compressive strength of high duty bricks should be more than

(a) 40 N/mm^2 (b) 20 N/mm^2
(c) 5 N/mm^2 (d) 3.5 N/mm^2

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (a) : Heavy duty bricks (IS:2180)–
• The burnt clay bricks having a compressive strength of more than 40 N/mm^2 are known as heavy duty bricks.
• It is used in masonary in heavy engineering works such as bridges, industrial foundations and multi-storeyed building.
• The water absorption of these bricks is limited to 5%.

40. According to I.S. specifications, the compressive strength of ordinary Portland cement (33 grade) after three days should not be les than :

(a) 7 MPa (b) 11.5 MPa
(c) 16 MPa (d) 21 MPa

MPSC AE PRE -27.03.2021

Ans. (c) : As per I.S. 269 : 2015–
• The compressive strength of ordinary portland cement grade-33 after 3 days should not be less than 16 N/mm^2 and 7 days compressive strength of OPC grade-33 should not be less than 22 MPa.
• The compressive strength of OPC grade 33 after 28 days should not be less than 33 N/mm^2.

41. The minimum compressive strength for rapid hardening Portland cement after 72 hours should be

(a) 18 N/mm^2 (b) 28 N/mm^2
(c) 24 N/mm^2 (d) None of these

MPSC AE PRE.-08.07.2018

Ans. (b) : The minimum compressive strength for rapid hardening Portland cement after 1 day and 3 days should be 16 MPa and 28 MPa respectively after casting.

42. The average life of Class I timber is

(a) 60 months (b) 90 months
(c) 120 months (d) 150 months

BPSC AE (GEN. ENGG.) 16.09.2018

Ans. (c) Classification of timber on the basis of average life.
1. Class I → > 120 months
2. Class II → > (60-120) months
3. Class III → > < 60 months

43. A good stone should have water absorption less than
(a) 0.4 (b) 0.6
(c) 0.8 (d) 0.9

BPSC AE (GEN. ENGG.) 16.09.2018

Ans. (b) A good stone should have water absorption less than 0.6% for road construction and 5% for building construction.
• If water absorption is more than 10% then stone is not used for construction work in buildings.

44. The minimum crushing strength of brick should be
(a) 35 kg/cm^2 (b) 50 kg/cm^2
(c) 15 kg/cm^2 (d) 20 kg/cm^2

BPSC AE (GEN. ENGG.) 16.09.2018

OR

The compressive strength of the brick should not be less than
(a) 3.5 MPa (b) 5 MPa
(c) 15 MPa (d) 20 MPa

BPSC AE (GEN. ENGG.) 16.09.2018

OR

The minimum crushing strength required for a brick as per BIS:1077-1957 is
(a) 3.5 N/mm^2 (b) 5 N/mm^2
(c) 2.5 N/mm^2 (d) 6 N/mm^2

JSSC JE (GEN. ENGG)-2017

OR

The required minimum compressive strength of building bricks as recommended by IS 1077-1957 and 1970 is
(a) 35 kg/cm^2 (b) 105 kg/cm^2
(c) 70 kg/cm^2 (d) 140 kg/cm^2

MPSC AE PRE.-08.07.2018

Ans. (a) : The required minimum compressive strength of building bricks as recommended by IS 1077-1957 and 1970 is–

Class not	**Average compressive strength less than – (N/mm^2)**
35	35.0
30	30.0
25	25.0
20	20.0
17.5	17.5
15	15.0
12.5	12.5
10	10.0
7.5	7.5
5	5.0
3.5	3.5

45. The ingredient which imparts hardness and colour to cement is
(a) alkali (b) alumina
(c) magnesia (d) sulphur

BPSC AE (GEN. ENGG.) 16.09.2018

Ans. (c) Magnesia–It imports hardness and colour to cement.
Alkali–Impurities imparts efflorescence if present in excess.
Alumina–Responsible for setting of cement.
Sulphur–Makes cement unsound and soundness due to excess of sulphur cannot be determined.

46. Which one of the following is responsible for red colour of brick?
(a) Iron oxide (b) Magnesia
(c) Silica (d) Alumina

BPSC AE (GEN. ENGG.) 16.09.2018

Ans. (a) : Iron oxide → Responsible for red colour
Magnesia → Excess of magnesia imparts yellowish tint
Silica → Imparts strength and hardness
Alumina → Imparts plasticity

47. Enamel paint is prepared by adding
(a) white lead or zinc
(b) alumina and zinc
(c) magnesia and alumina
(d) white lead and alumina

BPSC AE (GEN. ENGG.) 16.09.2018

Ans. (a) : Enamel paints–These paints are obtained by adding white lead or zinc white as a base material to a vehicle. These paints have better chemical resistance, water proofing and great appearance.

48. Pigments are added to
(a) give colour to paint
(b) reduce the cost of the paint
(c) hold the ingredients of the paint
(d) make the paint thinner

BPSC AE (GEN. ENGG.) 16.09.2018

Ans. (a) : Pigments are used to provide colour to the points for better appearance. Ex.–
1. Iron oxides
2. Chromium dioxide
3. Ultramarines
4. Manganese violet
5. Iron blue
6. Titanium dioxide

49. The base material of distemper is
(a) iron oxide (b) lithopone
(c) chalk (d) lime

BPSC AE (GEN. ENGG.) 16.09.2018

Ans. (c) : Distemper–It is made with base as white chalk and thinner as water. They are available in powder and paste forms and are substantially cheaper than paints. They are most suitable for plastered surface as well as white washed surface of interior walls.

50. Plywood is identified by

(a) thickness (b) volume

(c) area (d) weight

BPSC AE (GEN. ENGG.) 16.09.2018

Ans. (a) : Plywood–A wood panel glued under pressure from an odd number (usually 3 to 13) of layers/piles of veneers is known as plywood. The outer most veneers sheet in a plywood panel are called faces. Plywood may be classified upon direction of grains in the plies and on the type of adhesive used.
Normally, the alternate plies are oriented at 30º or 60º in star plywood. The faces are arranged with the grain at 45º to that of the centers in diagonal plywood. It is identified by its thickness.

51. The standard size of an ordinary brick is

(a) 22.5 cm × 19.0 cm × 0.0 cm

(b) 20 cm × 19.0 cm × 9 cm

(c) 19 cm × 9 cm × 9 cm

(d) none of the above

BPSC AE (GEN. ENGG.)-1995

Ans. (c) :
Standard size of bricks = (19 × 9 × 9) cm
Nominal size of brick = (20 ×10 × 10) cm
Traditional brick size = (23 × 11 × 7.3) cm or

$$9'' \times 4\frac{3''}{8} \times 2\frac{3''}{4}$$

Traditional nominal size of brick
= (23 × 11.4 × 7.6) cm
or $9'' \times 4\frac{1''}{2} \times 3''$
Size of frog = 10cm × 4cm × 1cm or 2cm
Unit weight of brick = 1800 kg/m^3
Average weight of brick = 3 kg to 3.5 kg
Number of bricks in 1 m^3 = 500 Nos.

52. The initial setting time of quick-setting cement is

(a) 30 seconds

(b) 5 minutes

(c) 30 minutes

(d) greater than 30 minutes

BPSC AE (GEN. ENGG.)-1995

Ans. (b) Quick setting cement–The setting action starts within 5 minutes and final setting is over in 30 minutes.
Low heat portland cement– The initial setting time for this cement is about one hour and the final setting time is about 10 hours.

53. Wood work should be painted to

(a) prevent against weathering effect

(b) impart better appearance

(c) both the above

(d) none of the above

BPSC AE (GEN. ENGG.)-1995

Ans. (c): Wood work should be painted to prevent against weathering effect, impart better appearance more durable and prevent fungus attack.

54. What type of glass should generally be used in bathrooms?

(a) ground glass (b) wired glass

(c) foam glass (d) all of them

BPSC AE (GEN. ENGG.)-1995

Ans. (a): Ground glass– In this type of glass one face of plate or sheet glass is made rough by grinding.
- It is used for maintaining privacy by obstructing vision and at the same time allowing light.
- The ground glass is used for bedrooms, toilets and for making black boards.

55. Which of the following statements is NOT correct with respect to properties of building stones?

(a) Fine grained stones with homogeneous distribution look attractive, and hence they are used for carving.

(b) Indian standard code recommends a minimum crushing strength of 1.5 N/mm^2 for all building stones.

(c) Generally denser stones are stronger in nature.

(d) Marble and granite give good appearance when polished

NHPC JE (EE) 05.04.2022 (Shift-II)

Ans. (a) : The properties of building stones–
1. Strength, the strength of the stone must be able to resist the applying load or overcoming load.
2. Durability, stone must stay in all climatic conditions and resist all the natural destructive effects it fasts for a long time.
3. Hardness and toughness, it should be enough strong and hard to withstand all the stresses applied due to seismic forces, wind loads and a load of the super structure.
4. Property of absorption and porosity, stones should not be porous and not allow rain water or any type of acidic water to pass through it.
It is impermeable to any type of liquid also, the stone must not show any absorption characteristics for liquid.

56. Which of the following types of rocks exhibits greatest crushing strength when compared to the other mentioned type of rocks ?

(a) Sandstone (b) Laterite

(c) Shale (d) Trap

NHPC JE (Civil) 04.04.2022 (Shift-II)

Ans. (d) :

Types of stone	Crushing strength (kg/cm^2)
Sand stone	650
Laterite	18 - 32
Lime stone	550
Basalt and trap	1530 - 1890

57. Which of the following types of rock exhibits less crushing strength when compared to other mentioned type of rocks ?

(a) Laterite (b) Trap
(c) Granite (d) Gneiss

NHPC JE (Civil) 04.04.2022 (Shift-I)

Ans. (a) : • Laterite rock exhibits less crushing strength 18-32 kg/cm^2.

Types of stone	Crushing strength (kg/cm^2)
Sand stone	650
Laterite	18 - 32
Lime stone	550
Basalt and trap	1530 - 1890

58. Which of the following is NOT a durability test conducted on building stones?

(a) Moh's scale test (b) Acid test
(c) Smith test (d) Brard's test

NHPC JE (EE) 05.04.2022 (Shift-I)

Ans. (a) : A durability test conducted on building stones are followings–

Test	Purpose
Smith test	For presence of soluble matter
Brard's test	For frost resistance
Acid test	To check whether resistance

• Hardness of stone is determined by Moh's scale test.

59. Galvanized iron is coated with _____.

(a) Tin (b) Zinc
(c) Lead (d) Copper

IREL Diploma Trainee-11.09.2022

Ans. (b) : Galvanized iron is coated with zinc in order to protect the iron from rusting. The process of applying layer of zinc to iron is called as galvanization.

60. Which one of the following metals is corrosion-resistant?

(a) Aluminium (b) Tin
(c) Copper (d) Mild steel

IREL Diploma Trainee-11.09.2022

Ans. (b) : Tin is corrosion resistant metal among the given option chromium, iridium, stainless steel etc. are non-corrosive metals and alloys.

61. The process of drying timber or removing moisture or sap present in a freshly felled tree is known as _____.

(a) Seasoning (b) Drying
(c) Preserving (d) Hardening

IREL Diploma Trainee-11.09.2022

Ans. (a) : Seasoning–The process of drying timber or removing moisture or sap present in a freshly felled tree is known as seasoning of timber.
Drying– Removal of evaporable substance by air or heat.
Preserving– Protection by chemical or physical means.
Hardening– Improving strength.

62. Diamond hardness number is _____.

(a) 10 (b) 9
(c) 7 (d) 8

IREL Diploma Trainee-11.09.2022

Ans. (a) : Moh's scale–It is used to represent the hardness of minerals–
(i) Talc - 1
(ii) Gypsum - 2
(iii) Calcite - 3
(iv) Fluorite - 4
(v) Apatite - 5
(vi) Felspar - 6
(vii) Quartz - 7
(viii) Topaz - 8
(ix) Corundum - 9
(x) Diamond - 10

63. Process of reducing a solid body, such as rock to fragments by using an explosive is known as

(a) Blasting (b) Drilling
(c) Boring (d) Striping

IREL Diploma Trainee-11.09.2022

Ans. (a) : Blasting–Process of reducing a solid body, such as rock to fragments by using an explosive is known as blasting.

64. The mineral deposit in solid rock is called

(a) Ore (b) Magma
(c) Nebula (d) Shale

IREL Diploma Trainee-11.09.2022

Ans. (a) : A mineral is a solid, crystalline structure that naturally forms ore deposits and cannot be broken down into different substances.

Rock	Minerals
• Igneous rock	Quartz, feldspar, olivine, etc.
• Sedimentary	Gypsum, calcite, mica etc.
• Metamorphic	Quartzite, corundum, garnet etc.

65. Which one of the following is not a sedimentary rock?

(a) Sandstone (b) Limestone
(c) Gypsum (d) Marble

IREL Diploma Trainee-11.09.2022

Ans. (d) :

Sedimentary rock	Metamorphic rock
Sandstone	Quartzite
Limestone	Marble
Gypsum	Slate
Mud stone	Gneiss

66. Lime has been conventionally classified into how many types?

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

BPSC AE (GEN ENGG.)-25.03.2022

Ans. (d) : Lime has been conventionally classified into 3 types–
1. Hydraulic lime - Class A
2. Poor lime - Class B
3. Fate lime - Class C

Hydraulic lime–This lime is also known as the water lime as it sets under water. It contains clay and some amount of ferrous oxide. The hydraulic lime can set under water and in thick walls where there is no free circulation of air.

Poor lime–

• It is also called as impure or lean lime.
• It is less than 70% pure.
• It is normally used in brick work around foundation.
• It slakes very slowly.

Fat lime–This lime is also known as the high calcium lime. Pure lime, rich lime or white lime.

• It slakes vigorously and its volume is increased to about 2-2.5 times the volume that of quick lime.
• It is used in white wash and plastering.

67. Which of the following is the lightest among the following?

(a) Magnesium (b) Aluminium
(c) Titanium (d) Copper

BPSC AE (GEN ENGG.)-25.03.2022

Ans. (a) : Magnesium is lightest among aluminium, titanium, copper and magnesium.

• Density of magnesium = 1740 Kg/m^3
• Magnesium is extremely light and 33% lighter than aluminium.

Sr. No.	Metal	Molecular weight
1.	Magnesium	24.305 amu
2.	Aluminium	26.981 amu
3.	Iron	55.845 amu
4.	Copper	63.546 amu

Note–The commission has accepted answer (b).

68. Which of the following metals is highly prone to corrosion?

(a) Aluminium (b) Copper
(c) Iron (d) Zinc

BPSC AE (GEN ENGG.)- 5.03.2022

Ans. (d) : Zinc is highly prone to corrosion among aluminium, copper, iron and zinc. Hence, used as sacrificial anode or in galvanization.

• It is oxidation induced deterioration of both metals and non-metals.
• Corrosion reduces the durability of these substance.
• Corrosion is the gradual deterioration of material by chemical or electrochemical reaction with their environment.

69. Steel with _____carbon is known as hypo-eutectoid steel.

(a) 0.8% (b) below 0.8%
(c) above 0.8% (d) None of the above

BPSC AE (GEN ENGG.)-25.03.2022

Ans. (b) : • A plain carbon steel containing 0.8% carbon is known as eutectoid steel. If the carbon content of the steel is less than 0.8% it is called hypo-eutectoid steel. Most of the steels produced commercially are hypo-eutectoid steels.

• The steels which contain more than 0.8% of carbon are called hypereutectoid steels.
• Hypereutectoid steels with carbon content upto 1.4% are produced commercially.

70. The common household glass is

(a) soda-lime glass (b) borosilicate glass
(c) high silica glass (d) lead glass

BPSC AE (GEN. ENGG.) 14.10.2022

Ans. (a) : Soda lime– It is the most common household glass (90% of glass is made) and least expensive.

• It is constituents are fusion of silica, lime soda and alumina. It is commonly used for window and door. It is also known as window glass.

Borosilicate glass– It is main constituents are lime and feldspar and fusion of silica. It is mainly used for medical and engineering field.

Lead glass– It is also called lead-oxide glass or lead crystal is at least 20% least oxide. It has also been called flint glass. It is softer glass making it easier to cut into designs that show off its high refractive index.

71. Three main chemical constituents of wood are

(a) cellulose 15% - 35%, hemicellulose 40% - 50%, lignin (phenyl group) 20% - 35%
(b) cellulose 20% - 35%, hemicellulose 40% - 50%, lignin (phenyl group) 10% - 15%
(c) cellulose 40% - 50%, hemicellulose 20% - 35%, lignin (phenyl group) 15% - 35%
(d) cellulose 15% - 35%, hemicellulose 50% - 60%, lignin (phenyl group) 10% - 18%

BPSC AE (GEN. ENGG.) 11.11.2022

Ans. (c) : Wood–Wood is a natural resource and one of the most attractive materials because of its multi-dimensional assembly and its extensive exhibition on Global.

• Wood is made up of cellulose, hemicellulose and lignin to make their multifaceted structure which is biologically originated.
• The chemically modified or monomer incorporation of three cell wall.
• The main objective of chemical modification or monomer impregnation of wood to revolute its properties and to increase its performance.
• Cellulose content ranges from (40 to 50%) and hemi celluloses range from (25 to 35%) lignin range from (15 to 35)%.

72. The approximate composition of Portland cement is

(a) tricalcium silicate 58%, dicalcium silicate 17%, tricalcium aluminate 8%, tetracalcium aluminoferrite 10% and other bonding agents 7%
(b) tricalcium silicate 45%, dicalcium silicate 30%, tricalcium aluminate 10%, tetracalcium aluminoferrite 8% and other bonding agents 7%
(c) tricalcium silicate 30%, dicalcium silicate 45%, tricalcium aluminate 8%, tetracalcium aluminoferrite 10% and other bonding agents 7%
(d) tricalcium silicate 10%, dicalcium silicate 40%, tricalcium aluminate 35%, tetracalcium aluminoferrite 5% and other bonding agents 10%

BPSC AE (GEN. ENGG.) 11.11.2022

Ans. (b): The approximate composition of Portland cement is–
Then it fuses and following four major compounds are formed–

Principal mineral	Compound	Avg	Symbol function
Tri-calcium silicate (Alite)	$3CaO.SiO_2$ (C_3S)	40%	7 days strength and hardness best cementing material
Dicalcium silicate (belite)	$2CaO.SiO_2$ (C_2S)	32%	Ultimate strength (1 year strength)
Tricalcium aluminate (Celite)	$3CaO.Al_2O_3$ (C_3A)	10%	Flash set, initial setting time
Tetra calcium alumina (Felite)	$4CaO.Al_2O_3Fe_2O_3$ (C_4AF)	8%	Poorest cementing value

73. The fire clay contains pure
(a) lime
(b) oxide of iron
(c) hydrated aluminium silicate
(d) magnesium

BPSC AE (GEN. ENGG.)-2006

Ans. (c) : Fire clay–The main component of refractory fire clay is hydrated aluminium. Silicates with tiny amounts of other mineral. The geological formation of fire clays depended on rock from the earth's crust being weathered by wind, rain cheat, cold and abrasion.

74. Plywood is obtained from :

RRB JE 27.08.2015 (Shift-II)

OR

Plywood is made from
(a) common timber (b) bamboo fiber
(c) teak wood only (d) asbestos sheets

BPSC AE (GEN. ENGG.)-2006

Ans. (c) : Plywood is made from teak wood only. Plywood is a construction material made from thin sheets of wood venier glued together. This is consisting of sheets of wood glued together with the grains of adjacent layer arranged at right angle.

75. The most fire resistant paints are
(a) enamel paints (b) aluminium paints
(c) asbestos paints (d) cement paints

BPSC AE (GEN. ENGG.)-2006

Ans. (c) Asbestos paints–Asbestos was very inexpensive and was used as filler in many different products in different industries. The most fire resistant paint are asbestos paints.

Enamel paints–It contain vehicle (binding material) like a styrene, polyvinyl lactate, alkyl resin etc.
Cement paints– The cement paint is water based paint is used to preventing water penetrating redemptions of drift collection prevent fungal and algal growth on interior and exterior walls.

76. Bullet proof glass is made of thick glass sheet sandwiched by a layer of
(a) steel (b) stainless steel
(c) high strength plastic (d) chromium plate

BPSC AE (GEN. ENGG.)-2006

Ans. (c) : Bullet proof glass is made of thick glass sheet sandwiched by a layer of high strength plastic.
Bullet proof glass is constructed using layer of plate glass and vinyl resin plastic. The thickness of outer layer is small as compared to inner layer.

77. Laterite is found in
(a) UP (b) Punjab
(c) West Bengal (d) Bihar
(e) Kerala

BPSC AE (GEN. ENGG.)-2006

Ans. (e) : Laterite is found in area with high temperature and heavy rainfall. These soils are mainly found in Karnataka, Kerala, Tamil Nadu and hilly areas of Odisha and Assam.

78. Stones used for the construction of retaining walls must be
(a) soft (b) hard
(c) light (d) heavy

BPSC AE (GEN. ENGG.)-2006

Ans. (d) Stones used for the construction of retaining walls must be heavy. Retaining wall is used to create a transition from one level of ground to another.
Heavy stone = Retaining wall
Hard stone = Masonary structure
Fire expose = Compressed sand stone

79. The compressive strength of a good Portland cement and standard sand mortar after 3 days of curing should not be less than
(a) 7 MN/m^2 (b) 11.5 MN/m^2
(c) 17.5 MN/m^2 (d) 21 MN/m^2

BPSC AE (GEN. ENGG.)-29.03.2019

Ans. (*)Compressive strength test–This test is carried out on standard cubes made of a good "Portland Cement" and standard motor (in 1:3 ratio) to determine the compressive strength of cement. According to Indian standard specifications, the average compressive strength for three cubes should not be less than 11.5 N/mm^2 and 17.5 N/mm^2 after 3 and 7 days of curing respectively.

80. Eminently hydraulic lime is one in which the percentage of silica, alumina and iron oxide is
(a) 5% – 10% (b) 10% – 25%
(c) 25% – 30% (d) 30% – 40%

BPSC AE (GEN. ENGG.)-29.03.2019

Ans. (c) Hydraulic lime–It is the lime which has small quantities of silica, alumina and iron oxide, which are in chemical combination with calcium oxide. It can set and become hard even in the absence of carbon dioxide and can set under water.
The hydraulic lime, depending upon the percentage of clayey impurities in the form of silica, alumina and iron oxide, are classified into the following three groups–
(a) Feebly hydraulic lime - 5 to 10%
(b) Moderately hydraulic lime - 10 to 25%
(c) Eminently hydraulic lime - 25 to 30%

81. The vehicle used in bronze paints is usually
(a) linseed oil
(b) naphtha
(c) water
(d) nitrocellulose lacquer

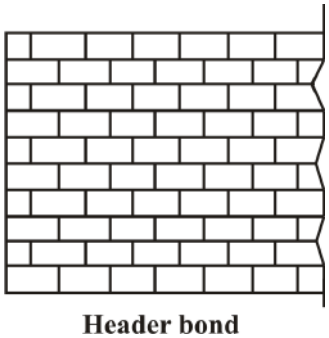
BPSC AE (GEN. ENGG.)-29.03.2019

Ans. (d) : Bronze points–Bronze points are reflective paints that are widely used on radiators. It can be used either for internal or external metal structure. General vehicle used in bronze paint is "nitrocellulose lacquer". Pigments used are aluminium bronze or copper bronze.
Vehicle/Binder–Holds the constituent of paint and spread over surface.
• If forms the body of the paint
• Linseed oil is the most widely used as vehicle.

82. The number of vertical joints in a stretcher course is x times the number of joints in the header course, where x is equal to
(a) $\frac{1}{2}$ (b) 1
(c) 2 (d) $\frac{1}{4}$

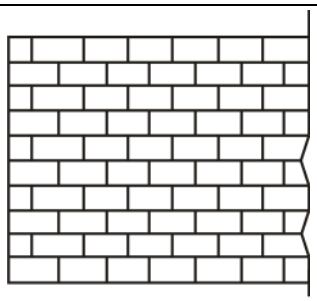
BPSC AE (GEN. ENGG.)-29.03.2019

Ans. (a) : Header–This is a brick laid with its breadth or width parallel to the face or front or direction of wall. The course containing headers is called course.



Header bond

Stretcher–This is a brick laid with its length parallel to the face or front or direction of a wall. The course containing is called a stretcher course.



Stretcher bond

$\therefore \quad \frac{\text{Length of a stretcher}}{\text{Length of a header}} \approx 2$

$\therefore$ The number of vertical joints in the stretcher bond is "half that of vertical joints" in the header bond in a course.

83. The amount of water used for 1 kg of distemper is
(a) 0.2 liter (b) 0.4 liter
(c) 0.6 liter (d) 0.8 liter

BPSC AE (GEN. ENGG.)-29.03.2019

Ans. (c) : Distempers–The distemper is made by mixing a dry pigment (chalk powder or whiting) with clean water and ordinary size.
• It is used on plastered surface not exposed to weather.
• This is used as interior paint for homes.
• Distemper are washed away when used in exposed surfaces.
• Normally, 500 to 700 ml water is required for 1kg of distemper. Hence we can take 0.6 litre of water for 1kg of distemper.

84. What is used to make paints odourless to some extent?
(a) Flat latex
(b) Celluloid sheets
(c) Acrylic compound
(d) Plioway resins

BPSC AE (GEN. ENGG.)-29.03.2019

Ans. (d) : Plioway resins– This is the substance used to make points odourless to some extent.
• It eliminates the odour that is normally present in the alkyd stain blocking primers.
• It aims at reducing the volatile organic compound (VOC) content which is harmful.
Advantages–
• Soluble in low odour solvents.
• Forms tough, durable films.
• Excellent adhesion to a wide variety of substrates.
• Barrier properties against water and carbon dioxide.

85. In Ordinary Portland cement the percentage of lime constitutes :
(a) 60 to 67 (b) 50 to 57
(c) 74 to 78 (d) 51 to 56

MPSC AE PRE. 23.06.2019

Ans. (a): Chemical composition of portland cement–

Oxides	Function	Composition (%)
CaO (Lime)	Controls strength and soundness its deficiency reduces strength and setting time	60-65
SiO_2 (silica)	Give strength, excise of it causes slow setting	17-25
Al_2O_3 (Alumina)	Responsible for quick setting, if in excess, it lowers the strength	3-8
Fe_2O_3 (Iron-Oxides)	Gives colour and hardness, if in excess, it causes crack in mortar and concrete and unsound-wise	5-4
$CaSO_4$	Retarder	2-5
SO_3 (Sulphur Trioxide)	Soundness	1-3%

86. Seasoning of timber is required to–

(a) Soften the timber
(b) Harden the timber
(c) Straighten the timber
(d) Remove sap from the timber

RRB JE 26.08.2015 (Shift-III)
RRB S.S.E (Bilaspur/Secunderabad) 21.12.2014

Ans : (d) Seasoning of timber:- The newly cutted trees have water in large quantity in sap and minimum in this inner part of wood.

- We remove sap of the wood, then do seasoning for drying the wood and making for structural use
- By drying the timber we make its strength high more elastic and durable.
- A well seasoned timber has 15% moisture content in it.

(I) Natural seasoning
(II) Artificial seasoning

87. Which of the following timbers is suitable for making sports goods?

(a) Mulberry (b) Mahogany
(c) Sal (d) Deodar

RRB JE 26.08.2015 (Shift-III)
BPSC AE (GEN. ENGG.) 14.10.2022

Ans. (a) : Mulberry is a strong tough and elastic wood, it takes up a clean finish. It can be well seasoned. It is turned and curved easily. Mulberry is typically used for baskets and sports good like hockey, tennis, rackets and cricket bats etc.

Mahogany–Mahogany wood has a beautiful reddish color and straight grains. It is used for furniture, chests and make a musical instruments.

Sal–It is less expensive when compared with the teak. The fruits of the sal tree are used in the treatment of expensive salivation, epilepsy and chlorosis.

• Polish not required but pointing is required.

Deodar–It is in great demand as building material because of its durability not resistant character and fine close grain.

88. Which of the following trees yields hard wood?

(a) Deodar (b) Chir
(c) Shishum (d) Pine

RRB JE 26.08.2015 (Shift-I)

Ans : (c) Hard wood : It is dark in colour.

- It's growth are slower and heavier in weight.
- It's annual rings are indistinct and strength is strong along and across the grains.
- Examples are – Teak, Sal, shishum and other deciduous trees.

89. Initial setting time is maximum for–

(a) Portland-Pozzolana cement
(b) Portland-Slag cement
(c) Low heat portland-pozzolana cement
(d) High strength portland cement

RRB JE 26.08.2015 (Shift-II)

Ans : (c)

Type of cement	Initial setting time
OPC	30 min.
Portland pozzolana cement	30 min.
Portland slag cement	30 min.
Low heat cement	60 min.
Rapid hardening cement	30 min.

90. The main ingredients of portland cement are–

(a) Lime and silica (b) Lime and alumina
(c) Silica and alumina (d) Lime and iron

RRB JE 26.08.2015 (Shift-II)

Ans : (a) Ingredient of cement–

Lime (CaO)	62-67%
Silica (SiO_2)	17-25%
Alumina (Al_2O_3)	3-8%
Calcium sulphate	3-4%
Iron Oxide	0.5-6%
Magnesia	0.5–4%
Sulphur	1–3%
Alkalies	0.2–1%

91. Plaster of Paris is obtained by calcining :

(a) Gypsum (b) Bauxite
(c) Lime stone (d) Kankar

RRB JE 27.08.2015 (Shift-II)

Ans : (a) • Plaster of Paris is prepared by heating calcium sulphate dihydrate, or gypsum to 120-180ºC.

- The plaster gets its name because, it main ingredient gypsum is found abundantly in Paris.
- Plaster of Paris is used to make casts and moulds.

92. A sample of cement is said to be sound when it does not contain free.

(a) Free Lime (b) Silica
(c) Iron oxide (d) Alumina

RRB JE 27.08.2015 (Shift-I)

Ans : (a) If free lime is in excess, it makes the cement unsound, cause it to expand and finally disintegrate.
- **Iron oxide**–Impart strength, hardness and colour to cement.
- **Alumina**–It imparts quick setting property to the cement.
- **Silica**–It imparts strength to cement.

93. Which is the purest form of iron?

(a) Cast iron
(b) Wrought iron
(c) Mild steel
(d) High Carbon Steel

RRB JE 27.08.2015 (Shift-I)

Ans : (b) Purest form of iron is wrought iron.

Carbon content in various iron material

Material	Carbon content
Cast iron	2-4.5%
High carbon steel	0.7-1.5%
Mild steel	up to 0.25%
Medium carbon steel	0.25-0.7%
Very low carbon steel	< 0.1%
Wrought iron	Does not exceed 0.15%

94. The strength of timber is maximum when load applied is–

(a) Parallel to grain
(b) Perpendicular to grain
(c) Inclined at 45^0 to grain
(d) Inclined at 60^0 to grain

RRB JE 28.08.2015 (Shift-I)

Ans : (a) • Compression strength of the timber section is found to be maximum parallel to the grains (along the longitudinal direction)
- Tensile strength of the timber section is found to be 2 to 4 times greater than its compressive strength parallel to the grains (weak in joint making not using the tension member acts).

95. Addition of pozzolana to ordinary portland cement increase–

(a) Bleeding
(b) Shrinkage
(c) Permeability
(d) Heat of hydration

RRB JE 28.08.2015 (Shift-I)

Ans : (b) Addition of pozzolana to ordinary portland cement increase in shrinkage, sulphate resistance and decrease in cost of cement, bleeding, permeability and heat of hydration.

96. A tight knot free from decay, which is solid across its face, and at least as hard as the surrounding wood.

(a) Punk knot (b) Pith knot
(c) Loose knot (d) Sound knot

RRB S.S.E. (Secunderabad) 02.09.2015 (Shift-I)

Ans : (d) Sound knot– A sound knot that is solid across its face, as hard as the surrounding wood, and shows no indication of decay.

97. Which of the following cement has maximum percentage of C_3S :

(a) Ordinary Portland cement
(b) Low heat cement
(c) Sulphate resisting cement
(d) Rapid hardening cement

RRB JE 28.08.2015 (Shift-II)

Ans : (d) • Rapid hardening cement is produced by finely grinding the cement clinkers such that SSA $\nless$ 3250 cm^2/kg and by increasing the proportion of C_3S ($\approx$ 56%)
- It is the type of cement, which attains higher rate of gain of strength in comparison to OPC.

98. On the basis of durability test, Forest Research Institute of India, Dehradun, a tree is highly durable if its average life is more than–

(a) 5 years (b) 10 years
(c) 15 years (d) 20 years

RRB JE 29.08.2015 (Shift-III)

Ans : (b) Based on the durability, timber is classified as–
High durability–Average life is more than 10 years
Moderate durability–Average life between 5 to 10 years
Low durability–Average life less than 5 years.

99. The setting and hardening of cement after addition of water is due to–

(a) The presence of gypsum
(b) Binding action of water
(c) Hydration of some of the constituent compounds of cement
(d) Evaporation of water

RRB JE 29.08.2015 (Shift-II)

Ans : (c) • The setting and hardening of cement after addition of water is due to hydration of some of the constituent compounds of cement such as tricalcium silicate, dicalcium silicate, tricalcium aluminate and tetra calcium aluminoferrite.

Tricalcium silicate (C_3S)–
- This is also called alite.
- Tricalcium silicate hydrates quickly and contributes more to the early strength.

Dicalcium silicate (C_2S)–
- This is also called as belite.
- The contribution of dicalcium silicate takes place after 7 days and may continue for up to 1 year.

Tricalcium aluminate (C_3A)–

- This is also called celite
- It is the quickest one to react when the water is added to the cement.
- It is responsible for flash setting.

Tetra Calcium Alumino Ferrite (C_4AF)–

- This is called as felite
- Tetra calcium alumino-ferrite is comparatively inactive.

100. A condition of timber during seasoning in which the different layers of wood are under stress by being under compression across the grain (usually due to rapid surface drying in the kiln).

(a) Case hardening (b) Air seasoning
(c) Air drying (d) Strain softening

RRB S.S.E. 03.09.2015 (Shift-I)

Ans : (a) Case hardening : It is due to the unequal drying of the exterior surface under compression and the interior surfaces under tension due to rapid drying.

- This happens at heavily loaded bottom stacks kept for seasoning.

101. A layer of wood formed during one year's growth in a timber is called as

(a) Bark (b) All-heart
(c) Batch (d) Annual ring

RRB S.S.E. 03.09.2015 (Shift-III)

Ans : (d) Annual rings :

- These are concentric layers of wood known as growth rings or annual rings.
- During growth season, the wood added during the early part is different from the wood added during the late part.
- The early wood is softer, coarser and more porous than the late wood.
- Growth rings are apparent because of this difference between the early wood and the late wood.

102. Normally, when ordinary Portland cement hydrates :

(a) Heat is absorbed (b) Heat evolves
(c) Heat neither evolves nor is absorbed
(d) Cement paste cools down below atmospheric temperature

RRB S.S.E. (Secunderabad) 01.09.2015 (Shift-I)

Ans. (b) When ordinary Portland cement hydrates it emitted heat because Hydration of OPC is exothermic reaction.

Exothermic reaction are reaction or process that releases energy usually in the form of heat or light.

103. Which of the following statements is false regarding glass?

(a) Cooling molten glass increases the viscosity of glass
(b) Rapid cooling results in the formation of fragile glass
(c) Annealing results in the formation of transparent glass
(d) Glass is good thermal conductor

RRB JE (Ranchi) 04.01.2015

Ans : (d) Glass–

- Glass is an inorganic solid material that is usually transparent or translucent as well as hard, brittle and impervious to the natural elements.
- Cooling molten glass increases the viscosity of glass.
- Rapid cooling results in the formation of fragile glass.
- Annealing results in the formation of transparent glass.
- Glass is a good thermal insulator.

104. Bitumen paints offer

(a) pleasing surface (b) hard surface
(c) smooth surface (d) protective surface

RRB JE (Ranchi) 04.01.2015

Ans : (d) Bitumen paints–

- This type of paint is manufactured by dissolving asphalt or vegetable bitumen in oil or petroleum.
- It is black in colour.
- It used over iron works under water

105. The binding material most commonly used in cemented carbide tool, is

(a) cobalt (b) lead
(c) graphite (d) carbon

RRB JE (Ranchi) 04.01.2015

Ans : (a) Cobalt–

- Cobalt is the binding material in cemented carbide.
- Cemented carbide is also called cermets, its constituent tungsten, titanium, tantalum.
- Cemented carbide manufactured by powder metallurgy.
- Its temperature from 900ºC to 1000ºC and cutting speed 150-200 m/min.
- These tool materials much harder are chemically more stable, have better hot hardness, high stiffness, and lower friction and operate at higher cutting speeds than HSS.

106. While machining……..materials, continuous chips are formed.

(a) heat-treated (b) ductile
(c) brittle (d) all of these

RRB JE (Ranchi) 04.01.2015

Ans : (b) Continuous chips– Formed during machining of ductile materials at high speed.

Favorable conditions for this type of chip to be formed are–

- Ductile material
- High cutting speed
- Large cutting angle
- Low depth of cut
- Proper use of coolant and lubricant

107. Which of the following is softwood?

(a) Deodar (b) Teak

(c) Sal (d) Mahogany

RRB JE 30.08.2015 (Shift-III)

Ans : (a) Difference between soft wood and hard wood–

Property	Softwood	Hardwood
Colour	Lighter	Darker
Growth	Faster	Slower
Weight	Lighter	Heavier
Density	Low	High
Annual ring	Distinct	Indistinct
Heart wood and sap wood	Cannot be distinguished	Can be distinguished
Strength	Strong along the grains	Strong along and across the grains
Conversion	Easy	Difficult
Resinous material	Exits in pores	Does not exist
Examples	Chir, fir, kail, deodar, pine and larch and other conifers	Teak, sal, sheesham and other deciduous tree

108. Small amount of carbonaceous material sprinkled on the inner surface of mould cavity is called–

(a) Backing sand (b) Facing sand

(c) Green sand (d) Dry sand

RRB JE 30.08.2015 (Shift-III)

Ans : (b) Facing sand–

- A sand used for facing of the mould is called facing sand.
- It is specially prepared sand from silica sand and clay, without the addition of used sand.
- The thickness of layer of facing sand in a mould ranges from 20 to 30 mm and is used directly next to the surface of the pattern.

109. Which of the following supplementary cementious materials have self-cementing properties?

(a) Class F fly ash

(b) Silica Fume

(c) Rice husk ash

(d) Ground-granulated blast furnace slag

RRB S.S.E. 03.09.2015 (Shift-II)

Ans (d) : • Ground-Granulated blast furnace slag have self-cementing property.

- Portland slag cement is produced by inter-grinding cement clinkers, hard-burnt gypsum and granulated blast furnace slag in specified proportion.

110. Normally the consistency of cement is measured using :

(a) Le-Chatelier's apparatus

(b) Blaine's parameter

(c) Vicat apparatus

(d) Venturimeter

RRB S.S.E. 03.09.2015 (Shift-II)

Ans (c) : Vicat apparatus–

- Vicat apparatus is a penetration device used to testing of hydraulic cement and similar materials to determine their normal or standard consisting.
- It is also used to determine the initial setting time.
- Needle with collar is used for final setting time.
- Plunger is used for standard consistency.

111. The time elapsed between the moment water is added to the ordinary Portland cement and the time when the cement completely loses its plasticity and can resist certain definite pressure is termed as :

(a) Initial setting time (b) Final setting time

(c) Hydration time (d) Gestation period

RRB S.S.E. 01.09.2015 (Shift-II)

Ans : (b) • Final setting time is referred as the time which is measured from the instant water is added in to the cement up to the extent it completely looses its plasticity and attain sufficient firmness to resist definite loading.

- Initial setting time is referred as the time which is measured from the instant water is added into the cement upto to the extent start loosing its plasticity.

112. The coarseness of the grains of a mineral is known as–

(a) Fracture (b) Texture

(c) Structure (d) Luster

RRB JE 16.09.2015 (Shift-III)

Ans : (b) Texture– The coarseness of the grains of a mineral is known as texture.

Luster– Luster is the way light interacts with the surface of a crystal, rock or mineral.

Fracture– A fracture is any separation in a geologic formation, such as a joint or a fault that divides the rock into two or more pieces.

113. The right time of deforestation from plain areas is–

(a) summer season (b) winter season

(c) rainy season (d) spring season

RRB JE 16.09.2015 (Shift-III)

Ans : (b) Deforestation–

- Deforestation can be defined as the large scale removal of trees from forests (or other lands) for the facilitation of human activities.
- The right time of deforestation from plain area is winder season.

114. Which of the following is not used as a supplementary cementitious material?

(a) Fly ash (b) Gypsum
(c) Rice husk ash (d) Silica fume

RRB S.S.E. 01.09.2015 (Shift-III)

Ans : (b) : Supplementary cementitious material is fly ash, rice husk ash, silica fume.

Artificial pozzolana, materials are a supplementary cementitious material like fly ash, ground blast-furnace slag, silica fume, surkhi, rice husk ash.

115. The chemical reaction between cement and water is:

(a) Hydration (b) Chlorination
(c) Calcination (d) None of these

RRB S.S.E (Bilaspur/Secunderabad) 21.12.2014

Ans : (a) Hydration of cement–

- The chemical reaction between cement and water is known as hydration of cement.
- The reaction takes place between the active components of cement C_4AF, C_3A, C_3S and C_2S and water.

116. Which of these rocks would have alumina as their component?

(a) Siliceous (b) Argillaceous
(c) Calcareous (d) Igneous

RRB S.S.E (Bilaspur/Secunderabad) 21.12.2014

Ans : (b) According to chemical classification, the rocks may be classified as follows–

Siliceous rocks–

- The principal constituent of these rock is silica. They are hard and durable and are not easily affected by weathering action.
- Example of such rocks are granite, map, sand stones etc.

Argillaceous rock–

- The rocks which contain clay or alumina as a main constituent is called argillaceous rocks.

Example– Slate, laterite and kaolin.

Calcareous rocks–

- The main constituent of these rocks is calcium carbonate.
- The durability of these rocks depends upon the constituents present in the surrounding atmosphere.
- Lime stone is a calcareous rock of sedimentary origin while marble is a calcareous rock of metamorphic origin.

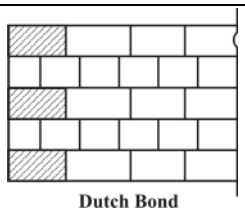
117. English Bond, Flemish Bond, Dutch Bond pertain to–

(a) Masonry work (b) Cement bonding
(c) Bonding between beams
(c) Bonding in foundation

RRB S.S.E (Bilaspur/Secunderabad) 21.12.2014

Ans : (a) English Bond, Flemish Bond, Dutch Bond are related to masonry work.

- **Dutch Bond:-** The Dutch bond is the modified version of the English bond where the corners of the walls are straightened.



Dutch Bond

118. Gypsum is used as an admixture in cement grouts for

(a) accelerating the setting time
(b) retarding the setting time
(c) increasing the elasticity
(d) reducing the grout shrinkage

RRB S.S.E (Bilaspur/Secunderabad) 21.12.2014

Ans : (b) Gypsum use in grouts:-

- Gypsam retard the setting time of cement.
- The paste of cement remain in mobile condition for 3 to 4 hour without setting.
- It control the rate of hydration and retard initial setting time.

119. The rock having calcium carbonate as main mineral constituent, is called:

(a) calcareous rock (b) argillaceous rock
(c) siliceous rock (d) sandy rock

RRB JE (Muzaffarpur) 14.12.2014

Ans. (a) : Calcareous Rock–In this rock calcium is predominate. **eg :** Marble and limestone.

Argillaceous rock– In this rock, alumina or clay predominates these are brittle and can't with stand shock. **eg :** slates, laterite

Siliceous rock– In this rock silica is predominate these are hard and durable.

eg : Granite and sandstone, quartzite.

120. Bricks used for lining furnaces are:

(a) under burnt bricks (b) over burnt bricks
(c) refractory bricks (d) all of these

RRB JE (Muzaffarpur) 14.12.2014

Ans. (c) : Fire-clay bricks or refractory bricks–

- Fire-clay bricks are made from fire-clay the process of manufacturing is as of an ordinary brick, burnt at very high temperatures in special kilns (Hoffman's kiln).
- These are used for lining blast furnaces, ovens, kilns, boilers and chimneys.

121. Fire bricks are used for…..

(a) To heat reflection
(b) To increase the heat flow
(c) decrease the heat flow
(d) All of these

RRB S.S.E (Bhopal) 21.12.2014

Ans:(c) Fire bricks are used for the following purposes–

- These are used for inner surface lining of kilns, turnacco, chimney etc.
- To build fire-resistance structures thereby reducing the damage of the structure against fire accidents.
- For inner lining of wood-fire ovens.
- As on insulating material for furnaces, ovens because of their lower thermal conductivity.

122. A pigment generally used to impart white colour in a paint is

(a) graphite (b) lead
(c) copper sulphate (d) zinc

RRB JE (Bilaspur/Guwahati/Patna) 14.12.2014

Ans. (d) : In paint zinc impart white colour.

Pigment	Colour
Zinc oxide	White
Copper sulphate	Green
Prussian blue, Indigo	Blue
Ivory black	Black
Red lead	Red

123. The outer protective layer of a tree is

(a) cambium layer (b) pitch
(c) bark (d) sap

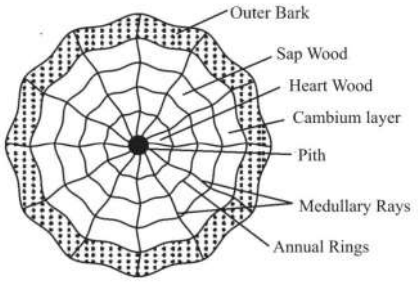
RRB JE (Bilaspur/Guwahati/Patna) 14.12.2014

Ans. (c) : Sap wood– The portion of the timber enclosed between the heart wood and cambium layer is known sap wood. Sap wood is light in colour than the heart wood.

Medullary rays – The thin radia fiberss extending from pith to cambium layer are known as the medullary rays. These rays help to hold the annual rings together.

Cambium layer – The function of cambium is to grow wood cells on the inside and smaller bast cell on the outside.

Bark – It protect the wood against mechanical damage. Its inner layer called bast conveys. The nutrients from the crown downwards and stores them.



124. Which lime is most suitable for white washing?

(a) quick lime (b) lime stone
(c) kankar lime (d) shell lime

RRB JE (Bilaspur/Guwahati/Patna) 14.12.2014

Ans. (a) : Quick lime : Calcium oxide (CaO), commonly known as quick lime or burnt lime, is a widely used chemical compound. it is a white, caustic, alkaline, crystalline solid at room temperature.

Lean lime : It is used in rough masonry work.

Hydraulic lime –

- It has ability to set under water in thick damp condition with no air circulation.
- Used in foundation of underwater work.

125. Lime mortar is generally made with

(a) Quick lime (b) Fat lime
(c) Hydraulic lime (d) White lime

RRB JE (Bilaspur/Guwahati) 14.12.2014

Ans: (c) Hydraulic lime–It is different in chemical composition from fat line in that it contains a definite amount of clay in addition to CaO, clay content in hydraulic lime may range from 10 to 30% by weight.

- This clay plus lime composition gives the hydraulic lime a property of hydraulicity.

Subdivision based on hydraulicity–

Class A – Eminently hydraulic – Clay content (21-30%)
Class B–Moderately hydraulic – Clay content (11-20%)
Class C – Feebly hydraulic – Clay content (5-10%)
Class D – Rich in magnesium, suitable only for finishing coats, do not process hydraulicity.

126. In paints, linseed oil is used as

(a) a solidifier (b) a driver
(c) a vehicle (d) a water proofing base

RRB JE (Bilaspur/Guwahati) 14.12.2014

Ans : (c) Linseed oil most common material used as a vehicle of paint. It is extracted from flax seeds. It is used in various grades.

Carrier in paint:– Carrier or vehicles are the liquid substances which hold the ingredients of a paint in liquid suspension.

They are required mainly for two reasons:–

(a) To make it possible to spread the paint evenly & uniformly.

(b) To provide a binding for the ingredients of paints various vehicles used in paints are as following–

(i) Linseed oil
(ii) Tung oil
(iii) poppy oil
(iv) Nut oil

127. Out of the following which is clay stone with vesicular texture ?

(a) Laterite (b) Sandstone
(c) Limestone (d) Granite

MPSC AE PRE.- 23.06.2019

Ans. (a): Argillaceous rocks–The predominant constituent is clay alumina which is actually clay, remains mixed up in varying proportion with siliceous, calcueous and carboneous matter. These are hard, brittle, durable and dense in nature.

Ex.–Laterite, slate,

128. Age of a tree be ascertained by–

(a) Radius of its Stem
(b) Number of Annual Rings
(c) Number of Branches
(d) Circumference of its Stem

RRB S.S.E (Bilaspur/Secunderabad) 21.12.2014

Ans : (b) The age of a tree can be estimated by the number of concentric rings on a cross-section of its trunk. A tree's age can be determined by counting the annual growth rings in its trunk. Each ring represents one year, and the ring's thickness reveals the relative amount of rainfall that year.

129. The component in cement which has the property of hydrating rapidly and is responsible to provide not only early strength but also the ultimate strength is

(a) Dicalcium Silicate (b) Tricalcium silicate
(c) Tricalcium Aluminate
(d) Tetra Calcium Alumino ferrite

MPSC AE PRE.- 23.06.2019

Ans. (b) : The component in cement which has the property of hydrating rapidly and is responsible to provide not only early strength but also the ultimate strength is tricalcium silicate.

Composition of cement clinker–

The principal mineral compound in Portland cement	Formula	Name	Symbol
Tricalcium silicate	$3CaO.SiO_2$	Alite	C_3A
Dicalcium silicate	$2CaO.SiO_2$	Belite	C_2S
Tricalcium aluminate	$3CaO.Al_2O_3$	Celite	C_3A
Tetracalcium alumino ferrite	$3CaO.Al_2O_3$ Fe_2O_3	Felite	C_4AF

Amount	Effect
30-50%	The hydrolysis of C_3S is mainly responsible for 7 day strength and hardness
25-50%	The hydrolysis of C_2S proceeds slowly. At early ages, less than a month, C_2S has little influence on strength and hardness.
5-11%	It rapidly react with water and is responsible for flash set of finely grounded clinker
8-14%	It is responsible for flash set but generates less heat

130. Which I.S. code has classified the bricks _____ according to compressive strength ?

(a) I.S. 927-2000 (b) I.S. 456-1978
(c) I.S. 1077-1992 (d) I.S. 825-1985

MPSC AE PRE -27.03.2021

Ans. (c) :
(i) **I.S.- 1077 : 1992 – Clause 4.1 :** The common brunt clay bricks shall be classified on the basis of average compressive strength.
(ii) **I.S.- 456 : 1978 –** IS code of practice for plain and reinforced concrete.
(iii) **I.S.- 3495 : 1992 – Part 1 -** Compressive strength test of bricks.
(iv) **I.S.- 455 : 1989 –** Portland slag cement specification.

131. Advantage of cast iron over mild steel is

(a) it has higher ductility
(b) it has relatively low melting point
(c) it has higher tensile strength
(d) it is more malleable

BPSC AE (GEN. ENGG.) 07.08.2019

Ans. (b) : Difference between cast iron and mild steel–

Cast iron		Mild steel
1. It contains more than 2% carbon	-	Mild steel contains less than 0.25% carbon
2. Cast iron less stronger than mild steel	-	Mild steel is stronger than cast iron
3. Cast iron over mild steel is has relatively low melting point	-	Mild steel has a higher melting point than cast iron
4. Its ductility is less than mild steel	-	It is more ductile than cast iron
5. Cast iron is more corrosion resistant	-	Its have less corrosive resistance property.

132. Chemicals used to protect timber from fungi and insects are called

(a) timber preservatives
(b) timber seasoning
(c) knots
(d) none of the above

BPSC AE (GEN. ENGG.) 07.08.2019

Ans. (a) : Preservation of timber is carried out to increase the life of timber Dichloro-diphenyl trichloro ethane (DDT), Creosote oil, organic solvent, ASCU treatment and various types of chemical treatment of timber which is used to protect timber from fungi and insects.

Various treatment process

Boucherie process–By this process, sapwood of almost all green timbers with the bark on and of bamboos in green condition soon after felling can be treated using any of the inorganic water soluble preservatives.

Empty cell process–It is aimed at a maximum penetration of the preservative with a minimum net retention.

133. Compressive strength of 2nd class brick is

(a) 105 kg/cm^2 (b) 70 kg/cm^2
(c) 35 kg/cm^2 (d) 125 kg/cm^2

BPSC AE (GEN. ENGG.) 07.08.2019

Ans. (b) : Classification of brick–

1. First class bricks–Its surface should be smooth and rectangular with parallel sharp and straight edges and square corner.
• Its water absorption should be upto 20%
• Its crushing strength = 105 kg/cm^2 or 10.5 N/mm^2.

2. Second class bricks–It is in irregular shape and size and its have rough, uneven faces may consist hairline cracks.
• Its water absorption should not greater than 22%
• Its crushing strength = 70 kg/cm^2 or 7 N/mm^2.

3. Third class bricks–It is in non-uniform shape and size with irregular and distorted edges.
• Water absorption should not greater than 25%
• Crushing strength = 35 kg/cm^2

134. The function of thinner in paint is

(a) it provides desired consistency
(b) it provides adhesion and integrity
(c) it provides colors
(d) it makes the surface tough after drying

BPSC AE (GEN. ENGG.) 07.08.2019

Ans. (a) : Composition of paint–
(i) Base–It is principal constituent of paint. It makes the paint film opaque and possesses binding propeties which reduce shrinkage cracks. Ex.–white lead, road lead, zinc white, oxide of iron.
(ii) Solvent or thinner–It make the paint of workable consistency and evaporate during drying of the film. Ex.–Spirit, Naptha, Turpentine oil.
(iii) Vehicle–It works as a binder. It holds the constituent of paint in suspension and helps spread it over the surface to be pointed. Ex.–Linseed oil, nut oil, poppy oil, tung oil.
(iv) Pigments–It used to import the desired color.
(v) Adultrants–It helps to reduce the weight and increase durability of paint.

135. ASCU treatment is given for

(a) prevention of corrosion of steel
(b) preservation of timber
(c) waterproofing of roof
(d) galvanising iron

BPSC AE (GEN. ENGG.)-2001

Ans. (b) : ASCU treatment–ASCU treatment is used for preservation of timber to enhance the strength of timber. ASCU stands for Arsenic Pentaoxide Copper Sulphate.
Creosote oil–It is also used for preservation of timber.
Sir Abel's process–It is used to treatment of timber making for fine resistance.

136. Efflorescence in bricks is caused by

(a) over burning of bricks
(b) too much lime in brick earth
(c) sodium or potassium salts in brick earth
(d) not soaking bricks in water before use.

BPSC AE (GEN. ENGG.)-2001

Ans. (c) : Efflorescence–These types of defect occurs in bricks due to excess of alkalies like as sodium or potassium salts in brick earth. These defects occur when bricks come in contact with moisture, water is absorbed and the alkalies crystalize.
Chuffs–Deformation of the shape of bricks caused by the rain water falling on hot bricks is known as chuffs.
Bloating–These types defeat observed as spongy swollen mass over the surface of burned bricks is caused due to presence of excess carbonaceous matter and sulphur in brick clay.

137. The final setting time for ordinary Portland cement should be not more than

RRB JE 29.08.2015 (Shift-I)

OR

As per IS specification, the maximum final setting time for ordinary portland cement should be–

(a) 30 minutes (b) 1 hour
(c) 6 hours (d) 10 hours

BPSC AE (GEN. ENGG.)-2001

Ans. (d) : • Portland cement is the most common variety of artificial cement and it is also known as normal setting cement or ordinary cement.
• This cement is classified as–
OPC - 33 Grade (IS : 269-1989)
OPC - 43 Grade (IS : 8112-1989)
OPC - 53 Grade (IS : 12669-1987)
• The ordinary portland cement has been classified as 33 grade, 43 grade and 53 grade.
• These are most commonly used in general concrete construction where there is no special durability requirement.
• Initial setting time should not be less than 30 minute and final setting time should not be greater than 600 minutes or 10 hours.

Cement	Initial setting time	Final setting time
Rapid hardening cement	30 minute	10 hours
High alumina cement	30 minute	10 hours
Alumina cement	3.5 hours	5.5 hours

138. The excessive amount of expansion due to unsound cement is usually related to

(a) Magnesia (b) Iron oxide
(c) Alkalies (d) Water

RRB S.S.E. (Secunderabad) 02.09.2015 (Shift-I)

Ans : (a) Soundness of cement– Soundness of portland cement refers to the ability of a hardened cement paste to retain its volume after setting without delayed expansion. Normal cement hydration reactions occurring due to setting and hardening tends to produce small charges in the volume of the hydrating paste if this change in volume of cement paste is in excess, then such cement is termed as unsound of expansion is caused by excessive amounts of free lime (CaO) or magnesia (MgO).

139. When standard fineness test is performed on a sample of 100 gm cement, then the residue should not exceed

(a) 10% by volume of cement
(b) 10% by weight of cement
(c) Both the above
(d) None of the above

BPSC AE (GEN. ENGG.)-1995

Ans. (b) : The test for fineness is conducted by sieve analysis or by finding the specific surface area.
Sieve analysis 100 grams of cement is sieved through IS sieve no. 9 for 15 minutes and the residue is weighed this should not exceed 10 percent.

140. When water is added to cement–

(a) Chemical reaction starts
(b) Heat is absorbed
(c) Heat is generated
(d) Impurities are washed out

RRB JE 26.08.2015 (Shift-I)

Ans: (a) When water is added to cement, the chemical reaction called hydration takes place and contributes to the final concrete product and heat is generated. The calcium silicates contributes most of the early strength.

141. After storage, the strength of cement–

(a) Decreases
(b) Increases
(c) Remains same
(d) May increase or decrease

RRB JE 27.08.2015 (Shift-III)

Ans: (a) The strength of cement decreases after storage.

Period	Reduction in strength
3 months	20%
6 months	30%
12 months	40%
24 months	50%

142. Which of the following oxide is in the LOWEST% in ordinary Portland cement?

(a) Iron oxide
(b) Magnesium oxide
(c) Soda–Potash
(d) Aluminium oxide

RRB S.S.E. (Secunderabad) 01.09.2015 (Shift-I)

Ans. (c) Soda-Potash has lowest % in OPC because it is harmful ingredient of cement. [0.2 - 1%].

- It causes efflorescence and undergo reaction with aggregates.

143. An electrochemical process over the surface of steel, leading to oxidation of the metal is called as :

(a) Oxidation (b) Corrosion
(c) Polishing (d) Laitance formation

RRB S.S.E. 01.09.2015 (Shift-II)

Ans : (b) Electrochemical corrosion–If wet electrochemical corrosion occurs damage is caused by two types of electro-chemical reaction on the surface of the steel. Oxidation reaction and reduction with oxidation reaction, otherwise termed metal dissolving reaction, metallic atoms enter into solution as metal ions, while electrons remain in the metal. In steel, the iron (Fe) dissolves as follows–

$$Fe = Fe^{2+} + 2e^{-}$$

144. The ability of the mould sand to withstand extreme temperature level is known as :

(a) Plasticity (b) Porosity
(c) Collapsibility (d) Refractoriness

RRB S.S.E. 01.09.2015 (Shift-II)

Ans : (d) Refractoriness–is defined as the ability of molding sand to withstand high temperatures without breaking down or fusing thus facilitating to get sound casting. It is a highly important characteristic of molding sands.

145. In low heat cement, the constituent that is kept at minimum. is:

(a) Dicalcium silicate
(b) Tricalcium silicate
(c) Teicalcium aluminate
(d) Tetracalcium aluminate

RRB JE (Muzaffarpur) 14.12.2014

Ans. (b) : Low heat cement (IS 12600-1989)–
Formation of cracks in large body of concrete due to heat of hydration has focused the attention of the concrete which produces less heat, at a low rate during the hydration process.
A low heat evolution is achieved by reducing the contents of C_3S and C_3A which are the compounds evolving the maximum heat of hydration and increasing C_2S.

146. Excess silica in cement

(a) Increases the setting time
(b) Decreases the setting time
(c) Weakens the strength of the cement
(d) Does not affect the setting time

RRB JE (Bilaspur/Guwahati/Patna) 14.12.2014

Ans. (a) : Silica (SiO_2) [17%-25%]

- It imparts strength to cement
- If it is in excess, strength of cement is increased but it also increases the setting time of cement.

147. Seven days minimum compressive strength of cement for 53 grade OPC is :

(a) 22 MPa (b) 37 MPa
(c) 15 MPa (d) 16 MPa

MPSC AE PRE -27.03.2021

Ans. (b) : As per I.S. 269 : 2015 compressive strength of OPC–

Time (days)	Compressive strength MPa (N/mm^2)		
	OPC 33	OPC 43	OPC 53
3 days	16	23	27
7 days	22	33	37
28 days	33	43	53

148. Portland Pozzolana cement when compared to ordinary Portland cement will give after 28 days

(a) More compressive strength
(b) Less compressive strength
(c) Equal compressive strength
(d) None of the above

BPSC AE (GEN. ENGG.) 07.08.2019

Ans. (b) : Comparison of gain in strength of concrete, when portland pozzolona cement compared to ordinary portland cement will give after 28 days is equal compressive strength but the concrete prepared with portland pozzolana cement gains strength at a slower rate earlier and reaches the designed strength in 28 days gaining strength of all concrete depends on age factor.
Note–In this question most precise answer is option (c) but commission is considered as option (b) is right.

02.

Concrete Technology

1. Aggregate particle size distribution follows which law?

(a) Pascal's law (b) Darcy's law
(c) Fuller's law (d) Ohm's law

JSSC JE (GEN. ENGG.)- 31.10.2022

Ans. (c) : Fuller's law–Fuller distribution is a typical wide particle size distribution that is applied to concrete aggregate gradations to achieve maximum packing density.

$$U(i) = 100 \times \left(\frac{i}{D_{max}} \right)^{h}$$

where,

i → the diameter of aggregate in each size group
U(i) → Cumulative volume of aggregate under i mm(%)
D_{max} → max diameter of aggregate in all size groups (mm)
h → Fuller exponential

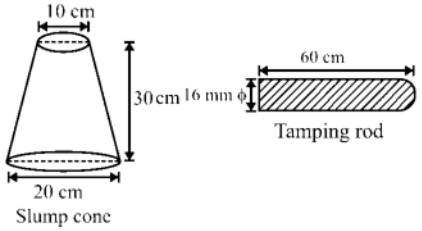
2. The standard dimensions of a slump cone used in a slump test for measuring fresh-properties of concrete is_____.

(a) Bottom diameter-10 cm, top diameter-10 cm, height-30 cm
(b) Bottom diameter-20 cm, top diameter-10 cm, height-30 cm
(c) Bottom diameter-20 cm, top diameter-20 cm, height-30 cm
(d) Bottom diameter-10 cm, top diameter-20 cm, height-30 cm

JSSC JE (GEN. ENGG.) 04.11.2022
JSSC JE (GEN. ENGG.)-23.10.2022

Ans. (b) : Slump test apparatus

• Metallic mould in the form of frustum of cone having internal dimensions as:
→ Bottom diameter - 20 cm
→ Top diameter - 10 cm
→ Height - 30 cm
• Steel tamping rod of 16 mm dia meter and 0.6 m long with a bullet end.



• Mould/slump cone is filled with fresh concrete in four layers and each layer is tamped for 25 times by a standard rod. The subsidence of concrete under gravity in mm is called slump.

Slump (mm)	Degree of workability	Consistency	Uses
0	Extremely low	Moist earth	Precast paving slabs
0-25	Very low	Very dry	Roads (Power vibrator)
25-50	low	Dry	Mass concreting
50-100	Medium	Plastic	Flat slabs, heavily R/F section
100-175	High	Semi-fluid	RCC with congested R/F

3. ____is the percentage passing for single-sized coarse aggregates of 20 mm nominal size from 20 mm IS sieve.

(a) 85 to 100% (b) 0 to 5%
(c) 30 to 70% (d) 0 to 30%

JSSC JE (GEN. ENGG.) 04.11.2022

Ans. (a) : Grading limits for single-sized aggregate of nominal size.

Sieve size (mm)	Percentage of passing for single-sized aggregates nominal size (by weight)					
	63 mm	40 mm	20 mm	16 mm	12.5 mm	10 mm
80	100	-	-	-	-	-
63	85 to 100	100	-	-	-	-
40	0 to 30	85 to 100	100	-	-	-
20	0 to 5	0 to 20	85 to 100	100	-	-
16	-	-	-	85 to 100	100	-
12.5	-	-	-	-	85 to 100	100
10	0 to 5	0 to 5	0 to 20	0 to 30	0 to 45	85 to 100
4.75	-	-	0 to 5	0 to 5	0 to 10	0 to 20
2.36	-	-	-	-	-	0 to 5

4. The total load to be applied for determining aggregate crushing value of aggregates passing through 12.5 mm and retained on 10 mm is_____.

(a) 40 tonnes (b) 20 tonnes
(c) 30 tonnes (d) 10 tonnes

JSSC JE (GEN. ENGG.) 04.11.2022

Ans. (a) : Aggregate crushing value test–

• This test helps to determine the aggregate crushing value of coarse aggregate as per IS : 2386 (Part 5).

• It gives a relative measure of resistance of an aggregate to crushing under gradually applied compressive load. Generally this test is conducted on single sized aggregate passing 12.5 mm sieve and retained on 10 mm sieve. The aggregate is tested in a surface dry condition.

• The cylinder (internal diameter 152 mm) of the test apparatus is filled with 3 equal layers of aggregate and each layer is tamped 25 strokes by the rounded and of temping rod. The total load should be 400 kN or 40 tonnes.

• IS : 383–1970 requires that the crushing value shall not exceed 45 percent for aggregate used for aggregate used for concrete other than for wearing surfaces and 30 percent for concrete wearing surface such as runway, roads and pavements.

5. What is the particle size (diameter) range of a boulder (coarse grained component)?

(a) More than 300 mm
(b) Passing 4.75 mm IS Sieve and retained on 75 micron IS Sieve
(c) Smaller than 300 mm and to be retained on 80 mm IS Sieve
(d) Passing 80 mm IS Sieve and retained on 4.75 mm IS Sieve

JSSC JE (GEN. ENGG.) 04.11.2022

Ans. (a) : Basic soil components (IS classification) IS : (1498-1970)

Soil	Soil component	Symbol	Particle size range and description
Course grained components	Boulder	None	Round to angular, bulky hard, rock particle, average diameter more than 300 mm
	Cobble	None	Round to angular, bulky hard, rock particle, average diameter smaller than 300 mm but retained on 80 mm size
	Gravel	G	Round to angular, bulky hard, rock particle passing 80 mm sieve but retained on 4.75 mm sieve Coarse:80 mm to 20 mm sieve Fine:20 mm to 4.7 mm sieve
	Sand	S	Round to angular, bulky hard, rock particle passing 4.75 mm sieve retained on 75 mm sieve Coarse:4.75 mm to 2.0 mm sieve Medium:2.0 mm to 425 μ sieve Fine:425 μ to 75 μ sieve
Fined grained	Silt	M	Particles smaller than 75 μ sieve identified by behaviour that it is slightly plastic or non-plastic regardless of moisture
	Clay	C	Particles smaller than 75 μ sieve identified by behaviour that it can be made to exhibit plastic properties within a certain range of moisture and exhibits considerable strength when air dried
	Organic matter	O	Organic matter in various sizes and stages of decomposition

Particle	Size (mm)
Boulder	> 300
Cobble	80 - 300
Gravel	4.75 - 80
Sand	0.075 - 4.75
Silt	0.002 - 0.075
Clay	< 0.002

6. Which of the following tests will NOT be used to measure the workability of concrete?

(a) Compaction factor test
(b) Slump test
(c) Flow test
(d) Segregation test

JSSC JE (GEN. ENGG.)- 03.11.2022

Ans. (d) : Workability– The term workability may be defined as the ease with which concrete may be mixed handled, transported, placed in position and compacted.

• Several tests which have been developed to measure the workability of concrete are-

→ Slump test
→ Compacting factor test
→ Vee-Bee test
→ Vibro-workability test

7. Which of the following aggregates gives maximum strength in concrete?

(a) Rounded aggregate
(b) Elongated aggregate
(c) Flaky aggregate
(d) Cubical aggregate

JPSC AE (GEN. ENGG)-2013

Ans. (d) : Cubical aggregate gives maximum strength in concrete. It has good packing and strength in all direction. It provide very good bend than other and most suitable for high strength concrete and pavements, the requirement of cement paste is relatively more.

8. The Los-Angeles test for coarse aggregate is used to find its:

(a) Compressive strength
(b) Specific gravity
(c) Abrasion value
(d) Impact strength

JSSC JE (GEN. ENGG.)- 03.11.2022

Ans. (c) : The abrasion value of coarse aggregate may be determine by either deval machine or by Los-Angles machine.

• Using Los-Angles machine the abrasive charge consists of cast iron sphere or steel spheres approximately 48 mm in diameter and each weighing between 390 and 445 g.

• The test sample consists of clean aggregate dried in an oven at 105^0–110^0C to substantially constant weight.

9. The Compressive strength of concrete is based on test performed upon concrete cube after how many days of mixing?/

(a) 28 days (b) 18 days
(c) 38 days (d) 30 days

JSSC JE (GEN. ENGG)-2017

Ans. (a) : The compressive strength of concrete is based on test performed upon concrete cube after 28 days of mixing.

Compressive strength test–

• Size of cube → 150 × 150 × 150 mm
Size of cylinder → 150 mm dia, 300 mm height.
• Cube would filled in 3 layers, tempered with tamping rod of 16 mm dia and 600 mm length.
• Rate of loading in compression testing machine = 14 N/mm^2/minute.
• Then immersed in water for 7 or 28 days.
Cube strength = 1.25 × cylinder strength

10. Which of the following is the CORRECT statement?

(a) Increase in water-cement ratio decreases the strength of concrete
(b) Increase in water-cement ratio increases the strength of concrete
(c) Water-cement ratio has no effect on the strength of concrete
(d) Decrease in water-cement ratio increases the workability of concrete

JSSC JE (GEN. ENGG)-2017

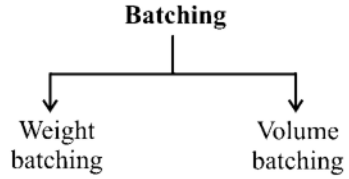
Ans. (a) : Water cement ratio is the water used to the quantum of cement in the mixture by weight.
• For proper workability the w/c ratio varies from 0.4-0.6.
• Increase in water cement ratio means porosity increases and strength decreases.

11. Batching of the material in making concrete should be done preferably by-

(a) Weight (b) Volume
(c) Size (d) Wooden box

JSSC JE (GEN. ENGG)-2017

Ans. (a) : Batching–The process of measuring ingredients to prepare concrete mix is known as batching of concrete.



1. Weight batching–Materials are measured on the basis of weight.
• It is accurate method of batching.
2. Volume batching–Materials are measured on the basis of volume.
• It is less precise method of batching.

12. The tensile strength of concrete is normally in which percentage slab of its compressive strength?

(a) 8-12% (b) 4-8%
(c) 12-16% (d) 16-20%

JSSC JE (GEN. ENGG)-2017

Ans. (a): The tensile strength of concrete is generally 10% of the compressive strength.
• Direct tensile strength = $[0.5 - 0.625]f_{cr}$
• Split tensile strength = $(f_{ct}) = \frac{2P}{\pi DL}$, $0.66\ f_{cr}$
• Flexure tensile strength = $(f_{cr}) = 0.7\sqrt{f_{ck}}$

13. What will be the quantity of water required per bag of cement for water-cement ratio of 0.55?
(a) 27.5 litres (b) 30 litres
(c) 25 litres (d) 22.5 litres

JSSC JE (GEN. ENGG)-2017

Ans. (a) : Given,
Water cement ratio = 0.55
Weight of one bag cement = 50 kg

$$\frac{\text{Water}}{\text{Cement}} = 0.55$$

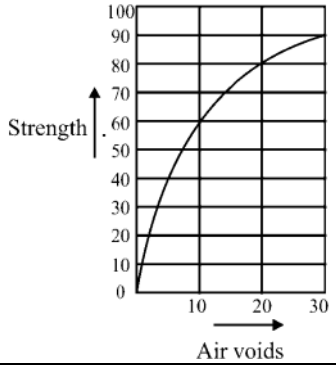
$$\frac{\text{Water}}{50} = 0.55$$

Water = 0.55×50
Water = 27.5 litres.

14. Compaction in concrete is done to eliminate
(a) Air bubbles (b) Water
(c) Impurities (d) Cement

JSSC JE (GEN. ENGG)-2017

Ans. (a) : Compaction of concrete–Compaction of concrete is the process of consolidating concrete after placing it in position.
• The main aim of consolidation of concrete is to eliminate air bubbles and thus to give maximum density to the concrete.
• 5% voids reduce 30% strength of concrete.



15. Which of the following type of mixture strength is required for acceleration?
(a) Lean mixture
(b) Chemically correct A/F ratio
(c) Rich mixture
(d) Too lean mixture

JSSC JE (GEN. ENGG)-2017

Ans. (c) : Rich mixes are less susceptible to bleeding than lean mixes.
• Richer mixes may have more adverse effect than that of lean mixes.
• Generally, high strength concrete or rich concrete is adversely affected by the use of large size aggregate, but in lean mixes or weaker concrete the influence of size of the aggregate gets reduced.

16. The sum of percentage of a deleterious materials in aggregate cell is not to exceed
(a) 5% (b) 10%
(c) 15% (d) 20%

BPSC AE (GEN. ENGG.)-13.03.2022

Ans. (a) : Deleterious materials in aggregate– The materials whose presence in aggregate may adversely affect the strength, workability and long termed performance of concrete are termed as deleterious materials.
• These are considered undesirable constituents. The total amount of deleterious materials in aggregate should not exceed 5% as per IS 383-1970.

17. The durability of concrete is proportional to
(a) Water cement ratio
(b) Sand content
(c) Cement – aggregate ratio
(d) Aggregate water ratio

BPSC AE (GEN. ENGG.)-13.03.2022

Ans. (c) : Durability of concrete–
• Durability of concrete is its capacity to resist the forces of disintegration owing to natural causes such as weathering, action of water containing chemicals, temperature changes including freezing and thawing, alterations in moisture content and chemical changes.
• The durability of concrete is proportional to cement-aggregate ratio.

18. Maximum size of coarse aggregate used as base coarse in ground floor is
(a) 12 mm (b) 20 mm
(c) 40 mm (d) 50 mm

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (c) : The grading of graded coarse aggregate for cement concrete flooring mix shall be within the limits given blow.

(a) Base concrete (lean cement or lime concrete)	Graded from 40 mm and below
(b) Cement concrete topping of thickness 40 mm and above	Graded from 16 mm and below
(c) Cement concrete topping of thickness 25 mm	Graded from 12.5 mm and below

19. Fineness modulus is
(a) The ratio of fine aggregates to coarse aggregate
(b) The ratio of fine aggregates to total aggregate
(c) An index which gives the mean size of the aggregates used in a mix
(d) None of the above

BPSC AE (GEN. ENGG.) 15.09.2018

Ans. (c): Fineness Modulus– The fineness modulus of an aggregate is an index number which is roughly proportional to the average size of particles in the aggregate. The coarser the aggregate, the higher the fineness modulus. The fineness modulus is obtained by aiding the percentage of the weight of material retained on IS sieves an dividing it by 100.

Limit of fineness modulus

Maximum size of aggregate		Fineness modulus	
		Maximum	Minimum
Fine aggregate		2.0	3.5
Coarse aggregate	20 mm	6.0	6.9
	40 mm	6.9	7.5
	75 mm	7.5	8.0
	150 mm	8.0	8.5

20. Which of the following types of concrete exhibits better toughness property and can be used in structures subjected to fatigue loads?

(a) Light weight concrete
(b) Self-compacting concrete
(c) Fiber reinforced concrete
(d) Plain cement concrete

NHPC JE (EE) 05.04.2022 (Shift-II)

Ans. (c) : Fiber reinforced concrete having ductility property so it can be exhibits better toughness property and can be used in structure subjected to fatigue load.

21. Which of the following is an example for grade of cement concrete ?

(a) CC304 (b) OPC 53
(c) M20 (d) Fe415

NHPC JE (Civil) 04.04.2022 (Shift-I)

Ans. (c) : • The M20 is an example for grade of cement concrete.
• M stands for mix and 20 is the characteristics strength after 28 days curing periods.

Proportion of different grade of concrete–

M10 - 1 : 3 : 6
M15 - 1 : 2 : 4
M20 - 1 : 1.5 : 30
M25 - 1 : 1 : 2

22. The property of concrete which reduces the amount of energy required to compact the concrete is called :

(a) Segregation (b) Workability
(c) Setting Time (d) Bleeding

NHPC JE (ME) 06.04.2022 (Shift-I)

Ans. (b) : Workability of concrete–Workability is an important property of concrete in its stage. Workability in simple can be defined as the ease with which the concrete can be mixed, transported, placed and compacted.
• The workability of concrete has also been defined as the amount of work required to place concrete and to compact it thoroughly.

The workability is associated with the following four concepts–
1. Ease of flow (internal friction)
2. Prevention of segregation
3. Prevention of harshness
4. Prevention of bleeding.

23. Which of the following concrete grades has mix proportion 1 : 1.5 : 3 (cement : fine aggregate : coarse aggregate) ?

(a) M10 (b) M30
(c) M20 (d) M40

NHPC JE (EE) 05.04.2022 (Shift-I)

Ans. (c) : The following concrete grades has mix proportion are–

Grade of concrete	Characteristics strength	Mix proportion
M5	5	1 : 5 : 10
M7.5	7.5	1 : 4 : 8
M10	10	1 : 3 : 6
M15	15	1 : 2 : 4
M20	20	1 : 1.5 : 3
M25	25	1 : 1 : 2

24. The recommended slump of concrete for hand-placed pavements is :

(a) 2-4 inches (b) 3-4 inches
(c) 4-6 inches (d) 1-3 inches

RRB S.S.E. 02.09.2015 (Shift-III)

Ans : (d) • For hand placed pavement slump value should be between 1 – 3 inches (25 – 75 mm).
• For trench fill – 100 - 150 mm
• For heavily reinforced section in slab, beam, columns – 50- 100 mm

25. Separation of water or sand or cement from a freshly mixed concrete is known as–

(a) Segregation (b) Creeping
(c) Bleeding (d) Flooding

RRB JE (Bilaspur/Kolkata/Mumbai/Guwahati)-14.12.2014

Ans. (c) : Bleeding– It is an autogenous flow of mixing water within or emergence to the surface from freshly placed concrete is usually due to excessive vibrations imparted to concrete to achieve full compaction.
Segregation–It is separation of coarse aggregate from fine aggregate.

26. Coarse aggregate means the aggregate that are retained on :

(a) 2.36 mm I.S. Sieve
(b) 2.0 mm I.S. Sieve
(c) 4.75 mm I.S. Sieve
(d) 0.425 mm I.S. Sieve

MPSC AE PRE -27.03.2021

Ans. (c) : Coarse aggregate–Aggregate retained on 4.75 mm IS sieve are identified as coarse aggregate. They are obtained by natural disintegration or by artificial crushing of rocks. The maximum size of coarse aggregate can be 80 mm.

27. Which strength of concrete is maximum?

(a) Compressive (b) Torsional
(c) Fatigue (d) Flexural

RRB JE (Chennai) 14.12.2014

Ans. (a) :

- Compressive strength of concrete is maximum.
- Compressive strength of concrete is the most important property of concrete, because other properties like stress-strain relationship, tensile strength, shear strength, bond strength, modulus of elasticity density, impermeability, durability etc. depends on it.

28. Cement concrete is a–

(a) Elastic material
(b) Visco-elastic material
(c) Non elastic material
(d) Plastic material

RRB JE 26.08.2015 (Shift-III)

Ans : (b) Cement is a visco-elastic material because concrete has combination of elastic and viscous behaviour where the applied stress results in an instantaneous elastic strain followed by a viscous, time-dependent strain.

29. As per Indian Standard specifications, concrete is designated into–

(a) 3 grades (b) 5 grades
(c) 7 grades (d) 10 grades

RRB JE 27.08.2015 (Shift-III)

Ans : (c) As per Indian standard specification, concrete is designated into 7 grades–

Grade	Group
M10 M15 M20	Ordinary group
M25 M30 M35 M40 M45 M50 M55	Standard concrete
M60 M65 M70 M75 M80	High strength concrete

30. The tensile strength of concrete is approximately what percent of compressive strength of concrete.

(a) 50% (b) 20%
(c) 10% (d) 5%

RRB JE 27.08.2015 (Shift-I)

Ans : (c) Tensile strength of concrete 10% of its compressive strength of 10%

$$= \frac{\text{Tensile strength}}{\text{Compressive strength}}$$

$$= \frac{100 \times 10\%}{100} = \frac{100 \times 10}{100 \times 100} = 0.1$$

31. According to IS 456, nominal mix concrete can be used upto which of the following grade

(a) 10 (b) 15
(c) 20 (d) 25

RRB S.S.E. (Secunderabad) 02.09.2015 (Shift-I)

Ans : (c) According to IS 456, nominal mix concrete can be used up to M20 or lower.

Nominal mix ratio–

M5	–	1 : 5 : 10
M7.5	–	1 : 4 : 8
M10	–	1 : 3 : 6
M15	–	1 : 2 : 4
M20	–	1 : 1.5 : 3

Design method–

1. Nominal mix (up to M20)
2. Design mix (IS 10262-1982)

32. The batching tolerance for cement as per IS 456 is

(a) ± 1% (b) ± 1.5%
(c) ± 2% (d) ± 3%

RRB S.S.E. (Secunderabad) 02.09.2015 (Shift-I)

Ans : (c) The batching tolerance for cement as per IS : 456 is ± 2%.

The accuracy of the measuring equipment shall be with in ±3% of the quantity of aggregate; admixtures and water.

33. Which one of the following does not react with concrete-

(a) Sewage water (b) Sulphuric acid
(c) Vegetable oil (d) Alcohol

RRB JE 28.08.2015 (Shift-III)

Ans : (d) Alcohol does not react with concrete due to this is non acidic and non corrosive, there is no present of minerals in cement and aggregates.

So, generally we can say that alcohol can used safely in concrete.

34. The rapid development of rigidity in a freshly mixed Portland cement paste, mortar, or concrete, usually happens with evolution of considerable heat. This rigidity cannot be dispelled, nor can the plasticity be regained, by further mixing without addition of water. This is called as

(a) False set (b) Flash set
(c) Rigidity index (d) Set acceleration

RRB S.S.E. 02.09.2015 (Shift-II)

Ans : (b) The rapid development of rigidity in a freshly mixed Portland cement paste, mortar, or concrete, usually happens with evolution of considerable heat. This rigidity cannot be dispelled, nor can the plasticity be regained, by further mixing without addition of water. This is called as flash set.

35. Bleeding of concrete is said to occur when–

(a) Finer particles settle down at the bottom
(b) Coarser particles get separated
(c) Cement paste rises to the surface of concrete
(d) Finer particles collect in isolated pockets

RRB JE 29.08.2015 (Shift-I)

Ans : (c) Bleeding of concrete is said to occur when cement paste rises to the surface of concrete and forming a thin layer on top of the concrete.

Reasons–

1. Insufficient compaction
2. Poorly graded aggregate
3. Laceration (cuts)
4. Crushing injuries

36. Grading of aggregate in a concrete mix is necessary to achieve–

(a) Adequate workability
(b) Higher density
(c) Reduction in voids
(d) Better durability

RRB JE 29.08.2015 (Shift-II)

Ans : (c) Grading of aggregate in a concrete mix is necessary to achieved reduction in voids.

For a good gradation of aggregate which have minimum void and sample paste generally fill the voids in the aggregate.

The paste requirement is the factor controlling the lost, since cement is the most expensive component.

37. The recommended slump for pumped concrete is :

(a) 1-2 inches (b) 2-4 inches
(c) 3-4 inches (d) 4-6 inches

RRB S.S.E. 03.09.2015 (Shift-I)

Ans : (d) Slump test used to find workability of concrete slump value for pumped concrete work is 4 to 6 inches.

- If coarse aggregate of size greater than 38mm are used, then slump test is not conducted. For low water content mix slump value is zero.

38. According to IS 516, what is the minimum number of specimen to be tested for estimating the compressive strength

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

RRB S.S.E. 03.09.2015 (Shift-III)

Ans : (b) According to IS 516, the minimum number of specimen to be tested for estimating the compressive strength is 3.

Consider no. of samples depending as quantity of concrete volume –

Concrete work in m^2	Number of sample
1-5	1
6-15	2
16-30	3
31-50	4
> 51	4 + 1 sample for each additional 50 m^3 or part there of

39. In general, the coefficient of thermal expansion of concrete does not depend on which of the following factors

(a) Type of cement (b) Type of aggregate
(c) The cement content
(d) The quality of water

RRB S.S.E. 03.09.2015 (Shift-III)

Ans : (d) Physical properties of concrete such as thermal expansion, etc depends upon type and quantity of cement. Physical properties do not depend upon quality of water.

40. Which of the following is not a non-destructive test used for concrete?

(a) Rebound hammer (b) Pull-out
(c) Ultra-sonic (d) Direct tensile test

RRB S.S.E. 03.09.2015 (Shift-III)

Ans : (d) Tests of concrete in which the specimen are not destroyed are known as non-destructive tests. Non-destructive test are –

(i) **Rebound hammer**→ To find compressive strength of concrete.

(ii) **Pull off test**→ To find compressive strength

(iii) **Ultrasonic test**→ To check quality of concrete and aggregates.

Direct tensile test is a destructive test on small specimens to find tensile strength. Direct tensile strength of concrete is difficult to determine, recourse is often taken to the determination of flexural strength or the splitting tensile strength and computing the direct tensile.

41. The minimum time before striking the formwork for columns as per IS 456 is :

(a) 14 – day (b) 7 – day
(c) 3 – day (d) 16 –24 hr.

RRB S.S.E. (Secunderabad) 01.09.2015 (Shift-I)

Ans. (d) The minimum time before striking the formwork for columns as per IS 456 is 16-24 hr.

Type of formwork	Minimum time before striking formwork
1. Vertical formworks to columns, wall beam	16-24 hours
2. Soffit formwork to beam	7 days
3. Props left under slab be remove after (a) Spanning up to 4.5 (b) Spanning over to 4.5	 7 days 14 days
4. Props left under beam of arches can be remove after (a) Spanning up to 6 m (b) Spanning over to 6m	 14 days 21 days

42. The minimum time before striking the props to arches (less than 6 m) as per IS 456 is :

(a) 14-day (b) 7-day

(c) 3-day (d) 16-24 h

RRB S.S.E. 01.09.2015 (Shift-II)

Ans : (a) According to IS 456–2000, minimum time after which props are removed.

S. No.	Type of formwork	Minimum period before striking formwork.
1.	Vertical formworks to columns, wall beam	16 – 24 hours
2.	Soffit formworks to slabs (props to be refixed immediately after removal of formwork)	3 days
3.	Soffit formworks to beams (props to be refixed immediately after removal of formwork)	7 days
4.	Props to slabs– (a) Spanning up to 4.5 m (b) Spanning over 4.5 m	 7 days 14 days
5.	Props to beam and arches (a) Spanning upto 6 m (b) Spanning over 6 m	 14 days 21 days

43. Concrete in a member represented by a core test shall be considered acceptable, if the average equivalent cube strength of the cores is equal to at least X% of the corresponding cube strength. What is the value of X?

(a) 70 (b) 75

(c) 80 (d) 85

RRB S.S.E. 03.09.2015 (Shift-II)

Ans (d) : Concrete is the member represented by a core test shall be considered acceptable, if the average equivalent cube strength of the cores is equal to at least 85 percent of the cube strength of the grade of concrete specified for the corresponding age and no individual core has a strength less than 75 percent.

44. Which of the following is not used in the design of concrete mixes as per the relevant Indian standard?

(a) Air content

(b) Water content

(c) Admixture content

(d) Bulk density of cement

RRB S.S.E. 01.09.2015 (Shift-III)

Ans : (d) Factors affecting the choice of mix proportioning.

- Compressive strength
- Workability
- Maximum nominal size of aggregate
- Grading and type of aggregate.

45. Strength of commonly used concrete, for constructing low rise residential building is:

(a) 300 psi (b) 8000 psi

(c) 15000 psi (d) 25000 psi

RRB S.S.E (Bilaspur/Secunderabad) 21.12.2014

Ans : (c) Strength of commonly used concrete, for constructing low rise residential building is 15000 psi.

46. The activity of batching in production of concrete refers to:

(a) Weighing of all ingredients within the acceptable tolerances for all batches

(b) Weighing of all ingredients

(c) Most accurate weighing of cement & water that influence strength of concrete

(d) Measuring the workability of concrete

RRB S.S.E (Bilaspur/Secunderabad) 21.12.2014

Ans : (a) The activity of batching in production of concrete refers to weighing of all ingredients within the acceptable tolerances for all batches.

Batching–It refers to controlling the quantity of each material required for making a concrete mix in each batch.

Aggregate, admixture & water measured with accuracy of ±3% batch quantity & cement has ±2% of batch quantity.

There are two types of batching–

1. Weight batching
2. Volume batching

47. The grade M25 of concrete would approx, refer to the mix

(a) 1 : 3 : 6 (b) 1 : 2 : 4

(c) 1 : 1 : 2 (d) 1 : 4 : 8

RRB JE (Bilaspur/Guwahati/Patna) 14.12.2014

Ans. (c):

Grade of concrete	Characteristics strength	Mix proportion
M5	5	1 : 5 : 10
M7.5	7.5	1 : 4 : 8
M10	10	1 : 3 : 6
M15	15	1 : 2 : 4
M20	20	1 : 1.5 : 3
M25	25	1 : 1 : 2

48. The function of sand in concrete is

(a) To reduce shrinkage
(b) To promote in cement hydration
(c) To prevent efflorescence
(d) None of the above

BPSC AE (GEN. ENGG.) 07.08.2019

Ans. (a) : Sand is used in concrete as an inert material.
Property of sand in concrete mix–
(i) Function of sand in concrete to reduce shrinkage.
(ii) It increases the volume of mortar and makes mortar more economical.
(iii) It renders structure more resistant against atmospheric agencies.
(iv) Well graded type sand adds to the density of mortar.

49. Rounded aggregate in concrete

(a) Requires more water for good workability
(b) Needs more cement for a giving strength
(c) Causes greater shrinkage
(d) Leads to poor development of bond

BPSC AE (GEN. ENGG.)-2001

Ans. (d) : Rounded aggregate– It require least water cement ratio while angular aggregate requires highest water cement ratio.
Angular aggregate– It have voids ratio ranging 38 to 45%. In case of angular aggregate interlocking between the particles is good and development of bond is also better than rounded aggregate.
Flaky aggregate– These types of aggregates least dimension in less than 3/5 of mean dimension.

50. Which of the following is not a physical property of materials?

(a) Abrasion
(b) Swelling
(c) Water absorption
(d) Bulk density

JSSC JE (GEN. ENGG.)- 03.07.2022

Ans. (a) : Abrasion is not a physical property of materials.
- Swelling, water adsorption and bulk density are physical property of materials.

51. With increase in moisture content, bulking of sand

(a) increases
(b) decreases
(c) first increases to a certain maximum value and then decreases
(d) first decreases to a certain minimum value and then increases

BPSC AE (GEN. ENGG.)-29.03.2019

Ans. (c) : Bulking of sand–The increase in the volume of sand due to the presence of moisture up to certain extent, is called bulking of sand.
- Increase in the volume of sand due to presence of surface moisture. As the moisture content of a fixed weight of sand increase, the volume also increases, which is known as bulking. The entrapped air escalates the sand volume between 5 to 10% depending on the grain size and shape of the sand particle.

Increase in moisture content by 5% to 10% can escalate sand volume between 15 to 40%.
- Variation in bulking of sand in coarse, medium and the grain sand with increase in moisture content.

52. The batching tolerance for aggregates as per IS 456 is

(a) ±1% (b) ±1.5%
(c) ±2% (d) ±3%

RRB S.S.E. 02.09.2015 (Shift-II)

Ans : (d) As per IS : 456-2000 clause 10.2–
The accuracy of the measuring equipment shall be within ±2% of the quantity of cement being measured the accuracy of the measuring equipment shall be within ±3% of the quantity of aggregate admixtures and water being measured.

53. Which of the following roles fly ash does not play in concrete

(a) Improving the workability
(b) Accelerating the strength gain
(c) Delaying the setting time of concrete
(d) Helps in long-term strength gain

RRB S.S.E. 01.09.2015 (Shift-II)

Ans : (b) Effect of Fly ash on cement concrete–
- Its reduce segregation and bleeding.
- Its improve workability of concrete.
- A 30% substitution of fly ash may result in an increase of initial setting time up 2 hours.
- Fly ash reduces the heat of hydration in concrete.
- Fly ash slightly improves the resistance of concrete to sulphate attack.
- The permeability of concrete reduces on addition of fly ash to cement.
- Addition of fly ash upto 30% may result in lower strength at 7 and 28 days, but may be about equal at 3 month and may further increase at ages greater than 3 months provided curing is continued.

03.

REINFORCEMENT CEMENT CONCRETE

1. Based on the assumptions made in the design for the limit state of collapse in flexure at IS : 456 - 2000, the limiting values of the depth of neutral axis for Fe-415 grade of steel is_____.

(a) 0.50 (b) 0.46
(c) 0.53 (d) 0.48

JSSC JE (GEN. ENGG.) 04.11.2022

Ans. (d) : Limiting depth of neutral axis

$$\left(\frac{x_u}{d}\right)_{lim} = \frac{0.0035}{0.0055 + \frac{0.87f_y}{E_S}}$$

$$(x_u)_{lim} = \frac{0.0035d}{0.0055 + \frac{0.87f_y}{E_S}}$$

• Value of $(x_u)_{lim}$ for various grades of steel–

Grade	$(x_u)_{lim}$	As per IS code
Fe250	0.5313	0.53
Fe415	0.4791	0.48
Fe500	0.4560	0.46

2. According to IS : 456-2000 'Plain and Reinforced Concrete-Code of Practice, and based on the assumptions made in the design for the limit state of collapse in flexure, for design purposes the compressive strength of concrete in the structure shall be assumed to be _____times the characteristic strength.

(a) 0.65 (b) 0.68
(c) 0.66 (d) 0.67

JSSC JE (GEN. ENGG.) 04.11.2022

Ans. (d) : Limit state of collapse : Flexure

Assumptions–

(a) Plain sections normal to the axis remain plane after bending.

(b) The maximum strain in concrete at the outmost compression fiber is taken as 0.0035 in bending.

(c) The relationship between the compressive stress distribution in concrete and the strain in concrete may be assumed to be rectangle, trapezoid, parabola or any other shape which results in prediction of strength in substantial agreement with the result of test.

(d) For design purposes, the compressive strength of concrete in the structure shall be assumed to be 0.67 times the characteristic strength. The partial safety factor $\gamma_m = 1.5$ shall be applied in addition to this.

(e) The tensile strength of the concrete is ignored.

(f) The maximum strain in the tension reinforcement in the section at failure shall not be less than:

$$\frac{f_y}{1.15E_S} + 0.002$$

where,

f_y = characteristic strength of steel

E_S = modulus of elasticity of steel

3. According to IS : 456-2000 'Plain and Reinforced Concrete-Code of Practice', _____ is the partial safety factor taken for concrete in assessing the strength of a structure of structural member for the limit state of collapse.

(a) 1.5 (b) 1.0
(c) 0.5 (d) 0

JSSC JE (GEN. ENGG.) 04.11.2022

Ans : (a) According to IS : 456-2000 for partial safety factor γ_m for material strength–

• When assessing the strength of a structure or structural member for the limit state of collapse, the value of partial safety factor, γ_m should be taken as 1.5 for concrete and 1.15 for steel.

4. Reinforced concrete sections in which tension steel reaches yield strain at loads lower than the load at which concrete reaches failure strain are called_____.

JSSC JE (GEN. ENGG.) 04.11.2022

Or

If the actual neutral axis of a beam lies above the critical neutral axis, then the beam is said to be a/an:

JSSC JE (GEN. ENGG.)- 03.11.2022

Or

In which of the following sections will the position of actual neutral axis (n) shift above the critical neutral axis (n_c) i.e. $n < n_c$ and steel is fully stressed and concrete is under stressed?

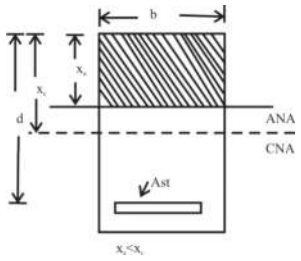
(a) under reinforced section
(b) critical section
(c) over reinforced section
(d) balanced section

JSSC JE (GEN. ENGG.)-23.10.2022

Ans : (a) Under reinforced section–

In which tension steel reaches yield strain at loads lower than the load at which concrete reaches failure strain are called under reinforced sections. It should be remembered that yielding of steel does not mean ultimate failure of the beam.

Moment of resistance (M_r) = $\sigma_{st} \times A_{st}\left(d - \frac{x}{3}\right)$



Note–

- For under reinforced section → $x_a < x_c$, Ductile failure
- For over reinforced section → $x_a > x_c$, Brittle failure
- For balanced section → $x_a = x_c$, Simultaneously failure in steel and concrete.

5. The stripping time of props to beams spanning over 6 m is:

(a) 21 days (b) 7 days
(c) 3 days (d) 14 days

JSSC JE (GEN. ENGG.)- 31.10.2022

Ans. (a) : Stripping time of formwork

Sr. No	Type of formwork	Minimum period before striking formwork
1.	Vertical formwork to columns walls and beams	16-24 hours
2.	Soffit formwork to slabs (props to be refixed immediately after removal of formwork)	3 days
3.	Soffit formwork to beams (props to be refixed immediately after removal of formwork)	7 days
4.	Props to slab Spanning upto 4.5 m Spanning over 4.5 m	 7 days 14 days
5.	Props to beam and arches Spanning upto 6 m Spanning over 6 m	 14 days 21 days

6. The distance between the centre of tensile reinforcement and the bottom edge of the beam is called.

(a) end cover
(b) effective cover
(c) nominal cover
(d) clear cover

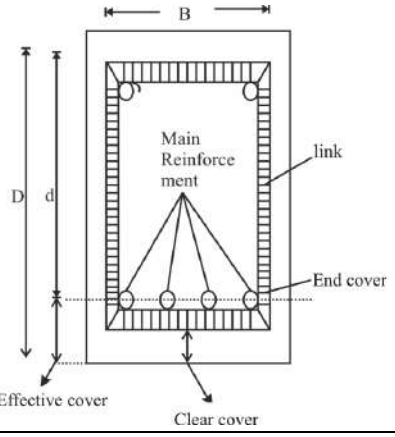
JSSC JE (GEN. ENGG.)-23.10.2022

Ans. (b) : Effective cover–It is the distance measured from the face of the member to the center of area (centroid) of the main reinforcement.

Effective cover = Overall depth – Effective depth

Nominal cover–It is the distance measured from the face of the member to the outermost face of the reinforcement including stirrups.

Clear cover–It is the distance between the outer surface of concrete to the nearest surface of reinforcing bar.



7. A concrete cylinder of size 150 mm diameter and 300 mm long is tested for split tensile strength of concrete. It failed at a load of 100 kN, the split tensile strength (in N/mm^2) is

(a) 0.35 (b) 0.71
(c) 1.42 (d) 2.83

JPSC AE (GEN. ENGG)-2013

Ans. (c) : Split tensile strength

Given– P = 100 kN
D = 150 mm
L = 300

Spliting tensile strength–

$$(F_{cr}) = \frac{2P}{\pi DL} = \frac{2\times100\times1000}{\pi\times150\times300}$$

F_{cr} = 1.4147 N/mm^2

F_{cr} = 1.42 N/mm^2

8. If the depth of critical neutral axis in a beam is less than the depth of actual neutral axis then the beam is called

JSSC JE (GEN. ENGG.)- 03.07.2022

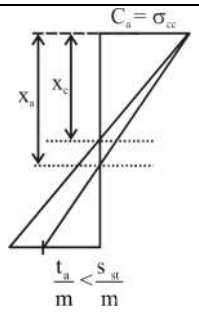
Or

In a singly Reinforced Beam, if the permissible stress in concrete reaches earlier than the permissible stress in steel, the Beam section is called:

RRB S.S.E (Bilaspur/Secunderabad) 21.12.2014

(a) Equivalent beam
(b) Balanced beam
(c) Over reinforced beam
(d) Under reinforced beam

Ans : (c) Over Reinforced section– In over reinforced section the percentage of steel provided greater than the balanced section. In this section stress in concrete reaches its permissible value while steel is not fully stressed.



• Concrete is brittle and its fail by crushing suddenly.
Under reinforced section– In this section percentage of steel provided less than balanced section. In this section stress in steel reached it permissible value while concrete not fully stressed.

9. The partial safety factor used for steel in reinforced concrete is:

(a) 0.0035 (b) 0.87
(c) 1.5 (d) 1.15

JSSC JE (GEN. ENGG.)- 03.11.2022

Ans. : (d) Values of partial safety factor–

Material	Limit state		
	Collapse	Deflection	Cracking
Concrete	1.5	1.0	1.3
Steel	1.15	1.0	1.0

Value of factor of safety in case of WSM

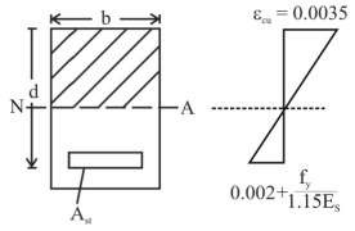
Material	FOS in WSM
Concrete	3
Steel	1.78

10. If f_y is the yield stress in steel and E_s is the Young's modulus of elasticity of steel, then the maximum strain in tension reinforcement at failure should NOT be less than:

(a) $\frac{f_y}{1.15E_s} - 0.02$ (b) $\frac{f_y}{1.15E_s} + 0.002$
(c) $\frac{f_y}{1.15E_s} + 0.02$ (d) $\frac{f_y}{1.15E_s} - 0.002$

JSSC JE (GEN. ENGG.)- 03.11.2022

Ans. : (b) As per IS 456 : 2000 strain diagram in concrete



Strain in tensile zone

$$\varepsilon_{su} = 0.002 + \frac{f_y}{1.15E_s}$$

Or

$$\varepsilon_{su} = 0.002 + \frac{0.87f_y}{E_s}$$

11. In an under-reinforced beam-

(a) the depth of neutral axis is less than the maximum depth of neutral axis
(b) the depth of neutral axis is more than the maximum depth of neutral axis
(c) the depth of neutral axis is equal to the maximum depth of neutral axis
(d) the area of steel is more than the required maximum percentage of steel

JSSC JE (GEN. ENGG)-2017

Ans. (a) : When $x_u < (x_u)_{lim}$, the steel in the tensile zone attains its maximum stress earlier, than concrete, the section will be under reinforced.
• $x_u < (x_u)_{lim} \rightarrow$ Over reinforced section
• $x_u = (x_u)_{lim} \rightarrow$ Balanced section

12. What is the recommended mix for the construction of long span arches?

(a) 1:1:2 (b) 1:2:2
(c) 1:3:6 (d) 1:4:8

JSSC JE (GEN. ENGG)-2017

Ans. (a) :

Strength	Nominal mix Design	Uses
M10	1 : 3 : 6	For PCC work
M20	1 : 1.5 : 3	For ordinary RCC work
M25	1 : 1 : 2	For heavy Loaded RCC work such as Beam arches column

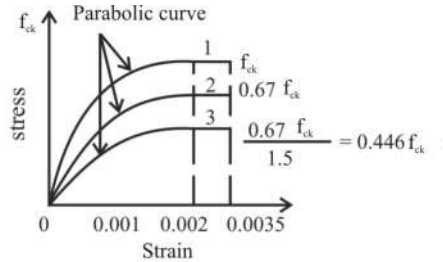
13. What is the assumed maximum strain in concrete for limit state of collapse in flexure?

(a) 0.0035 (b) 0.035
(c) 0.35 (d) 3.5

JSSC JE (GEN. ENGG)-2017

Ans. (a) : As per IS 456-2000, cl. 38.1– the maximum strain in concrete at the outer most compression fiber is taken as 0.0035 in bending.
• The maximum strain in tension reinforcement in the section at failure shall not be less than

$$\frac{f_y}{1.15E_s} + 0.002$$



14. The minimum shear reinforcement is provided in a beam if

(a) nominal shear stress is less than the design shear strength of concrete
(b) nominal shear stress is more than the design shear strength of concrete

(c) nominal shear stress is equal to the design shear strength of concrete
(d) nominal shear stress is equal to the permissible shear stress

JSSC JE (GEN. ENGG)-2017

Ans. (a) : If nominal shear stress is less than design shear strength than minimum shear reinforcement is provided.
Minimum shear reinforcement

$$0.87 f_y \, A_{sv} \left[\frac{d}{S_v}\right] = 0.4 \, bd$$

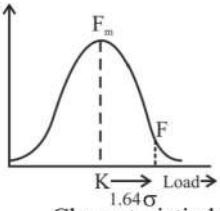
- If $\tau_v < \frac{\tau_c}{2}$ then No shear reinforcement is provided.
- If $\frac{\tau_c}{2} < \tau_v < \tau_c$ then minimum shear reinforcement is provided.
- If $\tau_v > \tau_c$ then shear reinforcement is designed for $(\tau_v - \tau_c)bd$.
- If $\tau_c > (\tau_c)_{max}$ then redesign section.

15. The value of load which has a 95% probability of NOT being exceeded during the life time of the structure is known as

(a) characteristic load (b) collapse load
(c) ultimate load (d) working load

JSSC JE (GEN. ENGG)-2017

Ans. (a) : As per IS 456:2000 cl-36.2–
Characteristic load–It means that the value of load which has a 95% probability of not being exceeded during the life of structure.



Characteristic load

16. In columns when both ends are restrained against translation and rotation, the effective length is/

(a) 1L (b) 2L
(c) 1.2L (d) 0.65L

JSSC JE (GEN. ENGG)-2017

Ans. (d) :

Compression member (End condition)	Recommended value of effective length
Effectively held in position and restrained against rotation in both ends	0.65 *l*
Effectively held in position at both ends but not restrained against rotation	1.00 *l*
Effectively held in position at both ends restrained against rotation at one end	0.80 *l*
Effectively held in position and restrained against rotation at one end but not held in position nor restrained against rotation at other end	2.00 *l*

17. As per IS: 456-2000, partial safety factor for Dead Load in limit state of collapse for load combination DL+LL is:

JSSC JE (GEN. ENGG.)- 31.10.2022

OR

The value of partial safety factor in limit state of collapse for the combination of dead and live load is

(a) 1.5 (b) 1.2
(c) 1 (d) 0.8

JSSC JE (GEN. ENGG)-2017

Ans. (a) : The value of partial safety factors recommended by IS: 456-2000 are given in the following table
Partial safety factor for loads, V_f

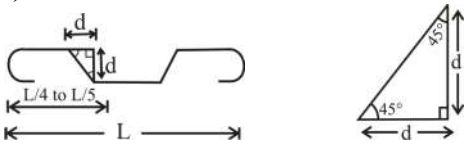
Load combination	Limit state of collapse			Limit state of serviceability		
	DL	LL	WL/EL	DL	LL	WL/EL
DL+LL	1.5	1.5	-	1.0	1.0	-
DL+WL/EL	1.5or 0.9	-	1.5	1.0	-	1.0
DL+LL+WL/EL	1.2	1.2	1.2	1.0	0.8	0.8
This Value is to be Considered when Stability against overturning or stress reversal is critical.						

18. For a 45° cranked or bent up bar the additional length for one bent up is

(a) 0.36 d (b) 0.42 d
(c) 0.24 d (d) 0.60 d

JSSC JE (GEN. ENGG)-2017

Ans. (b) :



$$= \frac{d}{\sin 45°} - d = \frac{d}{\sin 45°} - d = d(1.42 - 1)$$
$$= 0.42d$$

19. Grades of Concrete in Indian Standard Code are specified and designated by

(a) mix (b) durability
(c) workability (d) quality

JSSC JE (GEN. ENGG)-2017

Ans. (a) : Concrete mix design is the process of selecting suitable ingredients of concrete and determining their relative amounts with the objective of producing a concrete of the required workability, strength and durability as economically as possible.

Grade	Mix	Characteristic strength
M-10	1 : 3 : 6	10 N/mm^2
M-15	1 : 2 : 4	15 N/mm^2
M-20	1 : 1.5 : 3	20 N/mm^2
M-25	1 : 1 : 2	25 N/mm^2

20. Doubly reinforced sections are generally adopted when

(a) design moments exceed the moment of resistance of singly reinforced section
(b) moment of resistance of singly reinforced section exceeds the design moments
(c) dimensions of the beam are not predetermined
(d) length of the beam is fixed

JSSC JE (GEN. ENGG)-2017

Ans. (a) : Doubly reinforced sections are generally adopted when design moments exceed the moment of resistance.

• Double reinforced section is also provided to reduce deflection (long term) due to creep and shrinkage.

• Doubly reinforced section required for dynamic loading or stress reversal condition.

21. As per IS : 456-2000, which of the following is a classified type of reinforced cement concrete (RCC) slab ?

(a) Three-way slab
(b) Five-way slab
(c) Two-way slab
(d) Four-way slab

NHPC JE (Civil) 04.04.2022 (Shift-I)

Ans. (c) : As per IS : 456-2000 type of slab –

(i) One way slab–

$$\frac{L_y}{L_x} > 2$$

(ii) Two way slab–

$$\frac{L_y}{L_x} \le 2$$

where,

L_y = longer span

L_x = shorter span

22. In a spherical dome subjected to concentrated load at crown or uniformly distributed load, the meridional force is always

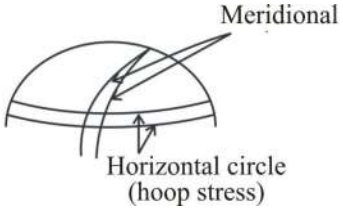
(a) zero
(b) tensile
(c) compressive
(d) tensile or compressive

BPSC AE (Civil) 30.03.2019

Ans. (c) : The primary stresses induced in the dome are –

(i) A compressive force acting along the meridian called the meridional thrust
(ii) A force compressive or tensile in nature acting along a horizontal circle on the dome called hoop stress.

- A spherical dome subjected to concentrated load or UDL at crown, the meridional force is always compressive.
- Meridional thrust is maximum at support and hoop force is maximum at crown.
- Radial bar are provided for meridional thrust while circular rings are provided for circumferential/hoop force.

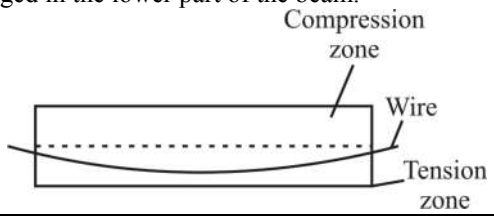


23. Normally prestressing wires are arranged in the

(a) upper part of the beam
(b) lower part of the beam
(c) centre
(d) Anywhere

BPSC AE (Civil) 30.03.2019

Ans. (b) : In pre-stressed concrete the purpose of prestressing lays in exerting pressure on the low tensile strength concrete in that areas, where the concrete normally is exposed to tensile stresses and threated by cracking and failure. Normally, prestressing wire are arranged in the lower part of the beam.



24. The purpose of lateral ties in short RC column is to

(a) avoid buckling of longitudinal bars
(b) facilitate construction
(c) facilitate compaction of concrete
(d) increase the load carrying capacity of the columns

BPSC AE (Civil) 30.03.2019

Ans. (a) : Lateral ties–

• The arrangement of lateral ties should be effective in fulfilling the above requirements.

• They should provide adequate lateral support to each longitudinal bar thereby preventing the outward movement of bar.

• Lateral ties is to prevent premature buckling of bars, improve strength, to provide resistance against shear and torsion.

$$\text{Tie diameter } \phi_t \ge \begin{cases} \phi \text{ long bar max}/4 \\ 6 \text{ mm} \end{cases}$$

$$\text{Tie spacing } s_t \le \begin{cases} D \\ 16\phi \text{ long bar mm} \\ 300 \text{ mm} \end{cases}$$

25. The side face reinforcement, if required in a T-beam will be

(a) 0.1% of the web area
(b) 0.15% of the web area
(c) 0.2% to 0.3% of the web area depending upon the breadth of the web
(d) half the longitudinal reinforcement

BPSC AE (Civil) 30.03.2019

Ans. (a) : According to IS 456:2000 clause 26.5.1.3 side face reinforcement -
Where the depth of the web in a beam exceeds 750 mm side face reinforcement shall be provided along the two faces. The total area of such reinforcement shall be not less than 0.1 percent of the web area and shall be distributed equally on two faces at a spacing not exceeding 300 mm or web thickness whichever is less.

26. Deep beams are designed for

(a) shear force only
(b) bending moment only
(c) both shear force and bending moment
(d) bearing

BPSC AE (Civil) 30.03.2019
RRB JE 28.08.2015 (Shift-III)

Ans. (c) : According to IS 456-2000–
• A beam shall be deemed to be a deep beam when the ratio of effective span to overall depth is less than $\frac{\ell}{D}$.
(1) 2.0 for a simply supported beam
(2) 2.5 for a continuous beam
Note–Deep beams are designed for bending moment and checked for shear.

27. The bending moment at the edge of a square vertical bunker of side length *l* due to a lateral pressure p per unit area is

(a) $pl^2/12$ (b) $pl^2/10$
(c) $pl^2/16$ (d) $pl^2/11$

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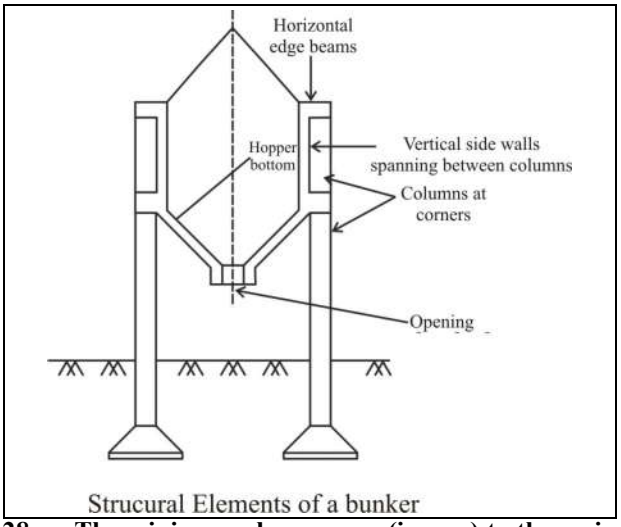
Ans. (a) : The bunkers are large size shallow bins to store grains coal and cement. In bunkers, the plane of rupture intersects the free surface of the stored material. Generally, steel bunkers are used to store coal at power plants and loco-running sheds. Generally these are square or rectangular shaped.
Maximum bending moment at corner or edge

$$= \frac{pl^2}{12}$$

Maximum bending moment at center

$$= \frac{pl^2}{24}$$



Strucural Elements of a bunker

28. The minimum clear covers (in mm) to the main steel bar in slab, beam, column and footing are respectively

(a) 10 , 15, 20, 25 (b) 15, 25, 40, 75
(c) 20, 25, 30, 40 (d) 20, 35, 40, 75

BPSC AE (Civil) 30.03.2019

Ans. (b) : Clear cover to main reinforcement

Slabs	- 15 mm
Beams	- 25 mm
Column (ϕ of bar > 12)	- 40 mm
(ϕ of bar < 12)	- 25 mm
Footing	- 50 mm

29. The main reinforcement of an RC slab consists of 10 mm bar at 10 cm spacing. If it is desired to replace 10 mm bar by 12 mm bar, then the spacing of 12 mm bars should be

(a) 12.0 cm (b) 14.0 cm
(c) 14.4 cm (d) 16.0 cm

BPSC AE (Civil) 30.03.2019

Ans. (c) : Main reinforcement bar dia (d_1) = 10 mm
Spacing of main reinforcement bar (S_1) = 10 cm
Replaced diameter d_2 = 12 mm
Replaced bar spacing (S_2) = ?

$$S_2 = \left(\frac{d_2}{d_1}\right)^2 \times S_1 = \left(\frac{12}{10}\right)^2 \times 10$$

S_2 = 14.4 cm

30. A steel beam supporting loads from the floor slabs as well as a from wall is termed as

(a) stringer beam
(b) lintel beam
(c) spandrel beam
(d) header beam

BPSC AE (Civil) 30.03.2019

Ans. (c) : Spandrel beam–In steel or concrete structure to spandrel beam is the exterior beam that stretches horizontally from one column to another column these are also known as edge beams.
Spandrel beams are provided on each floor which helps distinguish floor levels in high rise buildings.

31. In RCC beams, as the percentage area of tensile steel increases–

(a) Depth of neutral axis increases
(b) Depth of neutral axis decreases
(c) Depth of neutral axis does not change
(d) Lever arm increases

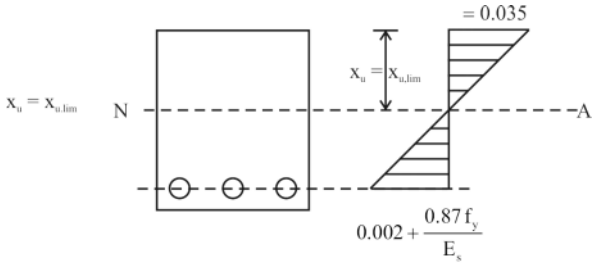
RRB JE 26.08.2015 (Shift-I)

Ans : (a) If, percentage are of tensile steel increases than depth of neutral axis increases.

Types of section beam–

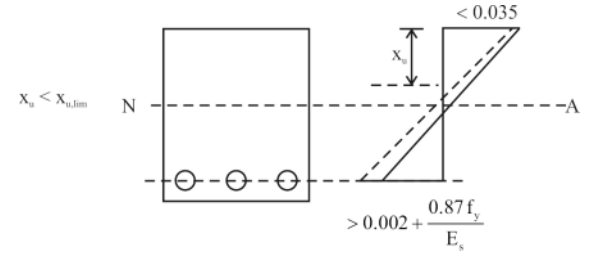
1. Balanced section beam–

• If depth of neutral axis is equal to depth of limiting neutral axis.

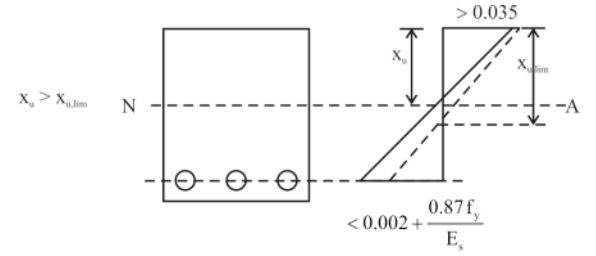


2. Under reinforced section beam–

• If depth of neutral axis is less than depth of limiting neutral axis.



3. Over reinforced beam–



32. The maximum percentage of moment redistribution allowed in RCC beams is–

(a) 10% (b) 20%
(c) 30% (d) 40%

RRB JE 26.08.2015 (Shift-II)

Ans : (c) As per IS 456 : 2000- the redistribution of moments may be carried out satisfying the following conditions.

(a) Equilibrium between the internal forces and the external loads is maintained.
(b) The ultimate moment of resistance provided at any section of a member is not less than 70% of the moment at that section obtained from an elastic maximum moment diagram covering all appropriate combination of loads.
(c) The elastic moment at any section in a member due to a particular combination of loads shall not be reduced by more than 30% of the numerically largest moments given anywhere by the elastic maximum moments diagrams for the particular member, covering all appropriate combination of loads.

33. For M-20 grade of concrete, the maximum shear stress shall not exceed :

(a) 1.6 N/mm^2 (b) 1.9 N/mm^2
(c) 2.8 N/mm^2 (d) 2.2 N/mm^2

RRB JE 27.08.2015 (Shift-II)

Ans : (c) Given,

Grade of concrete = M20 (20 N/mm^2)

Max. shear stress ($\tau_{c\,max}$) $= 0.63\sqrt{f_{ck}}$

$= 0.63\sqrt{20}$

$= 2.80$ N/mm^2

• Max. shear stress with shear reinforcement ($\tau_{c\,max.}$)

M	15	20	25	30	35	40 and above
LSM	2.5	2.8	3.1	3.5	3.7	4.0
WSM	1.6	1.8	1.9	2.2	2.3	2.5

34. The stress below which a material has a high probability of not failing under reversal of stress is known as :

(a) Tolerance limit
(b) Elastic limit
(c) Proportional limit
(d) Endurance limit

RRB JE 27.08.2015 (Shift-II)

Ans : (d) Endurance limit–

• Endurance limit is the stress level below which even a large number of stress cycles can not produce fatigue failure.

Endurance limit = $\frac{1}{2} \times \left(f_y\right)$

Where,

f_y – Ultimate tensile stress

Fatigue–The deformation of a material due to the repeated cycle of stress and strain resulting in progressive cracking.

35. The term nominal stress in stress-strain curve for mild steel implies–

(a) Average stress
(b) Actual stress
(c) Yield stress
(d) Stress at necking

RRB JE 27.08.2015 (Shift-III)

Ans : (a) The term nominal stress in stress-strain curve for mild steel implies the average stress that is calculated by dividing the applied load by the original cross-sectional area of the specimen.

36. Minimum grade of concrete to be used in reinforced concrete is–

(a) M 10 (b) M 15
(c) M 20 (c) M 25

RRB JE 27.08.2015 (Shift-III)

Ans : (c) According to IS code 456 : 2000–
• Minimum grade of concrete to be used in reinforced concrete is M20.
According to IS code 456 : 1978–
• Minimum grade of concrete to be used in reinforced concrete is M15.

37. How is the deflection in RC beams controlled as per IS : 456 ?

(a) By using large aspect ratio
(b) By using small modular ratio
(c) By controlling span/depth ratio
(d) By moderating water–cement ratio

RRB JE 28.08.2015 (Shift-II)

Ans : (c) According to IS 456-2000 clearly states that the control of deflection is governed by suitable a value which is span to effective depth ratios.

38. In the conventional pre-stressing, the diagonal tension in concrete–

(a) increase
(b) decreases
(c) does not change
(d) may increase of decrease

RRB JE 29.08.2015 (Shift-III)

Ans : (b) • In the conventional prestressing, the diagonal tension reduces as whole section is under compression generally in prestressing.

39. The reinforced concrete beam curved in plan is designed for–

(a) Bending moment and shear
(b) Bending moment and torsion
(c) Bending moment
(d) Bending moment, shear and torsion

RRB JE 29.08.2015 (Shift-I)

Ans : (d) • A reinforced concrete beam curved in the plane is structural element that is subjected to different types of loads. The loads can cause the beam to bend, shear or twist.

40. Permissible shear stress in concrete is a function of–

(a) Grade of concrete
(b) Grade of steel
(c) Percentage of steel reinforcement
(d) Percentage of steel reinforcement and grade of concrete

RRB JE 29.08.2015 (Shift-II)

Ans : (d) The permissible shear stress in concrete is a function of the percentage of steel reinforcement and the grade of concrete.

• The higher percentage of steel reinforcement and the grade of concrete, the higher the permissible shear stress.

$$\tau_c = 0.85\sqrt{0.8 f_{ck}}\,\frac{\left(\sqrt{1+5\beta}-1\right)}{6\beta}$$

Here,

$$\beta = \frac{0.8 f_{ck}}{6.89 P_t} \text{ and } P_t = \frac{100\ A_s}{bd}$$

41. According to IS-456, the modulus of elasticity of steel can be assumed as :

(a) 200 kN/mm^2 (b) 225 kN/mm^2
(c) 250 kN/mm^2 (d) 300 kN/mm^2

RRB S.S.E. 03.09.2015 (Shift-I)

Ans : (a) According to IS : 456-2000–
• Modulus of elasticity of steel is 200 kN/mm^2 or 2×10^5 N/mm^2.

42. Which of the following is not applicable to limit state method?

(a) The stresses are obtained from design loads and compared with design strengths
(b) The method follows linear stress-strain behavior of both the materials i.e. steel and concrete
(c) The ultimate stresses of the materials are used as allowable stresses
(d) Partial safety factors are used

RRB S.S.E. 03.09.2015 (Shift-III)

Ans : (b) Assumption as per IS 456 : 2000.
(a) Plane section normal to the axis remain plane after bending.
(b) The maximum strain in concrete at outermost compression fiber is taken as 0.0035 in bending.
(c) The relationship between the stress strain distribution in concrete is assumed to be parabolic.
(d) The tensile strength of the concrete is neglected.
(e) The relationship between the compressive stress distribution in concrete and the strain in concrete may be assumed to be rectangle, trapezoid, parabola or any other shape which results in predication of strength in substantial agreement with the result of test.
(f) The maximum strain in the tension reinforcement in the section at failure shall not less than.

$$= 0.002 + \frac{0.87 f_y}{E_s}$$

43. Which of the following does not fall under tensioning devices used for prestressed concrete?

(a) Chemical (b) Thermal
(c) Hydraulic (d) Rotating

RRB S.S.E. 03.09.2015 (Shift-III)

Ans : (d) Types of prestressing–
(i) Hydraulic prestressing
(ii) Thermal prestressing (Thermo-electric prestressing)
(iii) Chemical prestressing
(iv) Mechanical prestressing
(v) External prestressing
(vi) Internal prestressing.

44. According to IS 456, the approximate estimated flexural strength (MPa) of concrete of grade M50 (f_{ck} = 50 MPa) would be :
(a) 4.9 (b) 5.5
(c) 2.5 (d) 6.5

RRB S.S.E. (Secunderabad) 01.09.2015 (Shift-I)

Ans. (a) Given,
Grade of concrete = M50
f_{ck} = 50 N/mm^2 or MPa
Flexural strength (f_{cr}) = $0.7\sqrt{f_{ck}}$
$= 0.7\sqrt{50}$
f_{cr} = 4.949 N/mm^2 or MPa
f_{cr} = 4.9 MPa

45. The minimum yield stress for a Fe 415 is :
(a) 415 MPa (b) 395 MPa
(c) 500 MPa (d) 550 MPa

RRB S.S.E. (Secunderabad) 01.09.2015 (Shift-I)

Ans. (a)

Grade of steel	Minimum yield stress
Fe 250	250
Fe 415	415
Fe 500	500

46. According to IS 456, under normal circumstances, the maximum cement content in kg/cum (including fly ash and slag) allowed is
(a) 500 (b) 400
(c) 450 (d) 600

RRB S.S.E. 01.09.2015 (Shift-II)

Ans : (c) As per IS 456 : 2000 - under normal circumstances the maximum cement content (including fly ash and slag) allowed is 450 kg/m^3
- Cement content not including fly ash and ground granulated blast furnace slag in excess of 450 kg/m^3 should not be used unless special consideration has been given in the design to the increased risk of cracking due to drying shrinkage in thin sections or to early thermal cracking and to the increased risk of damage due to alkali silica reactions.

47. The failure of column depends upon–
(a) Weight of column
(b) Length of column
(c) Slenderness ratio
(d) Cross sectional area of column

RRB JE 16.09.2015 (Shift-III)

Ans : (c) • The failure of column depends upon its slenderness ratio. The load required to cause above mentioned failures decreases as the length of compression member increases, the cross-sectional area of the member being constant. Therefore, columns are commonly classified as short and long columns.

48. According to IS 456, if the maximum aggregate size is increased from 20 mm to 40 mm, the minimum cement content requirement changes (in kg/cum) by :
(a) –20 (b) 20
(c) –30 (d) 30

RRB S.S.E. 01.09.2015 (Shift-III)

Ans. (c) : Size of aggregate is increased from 20mm to 40mm the specific surface area decrease, due to which lesser amount of cement paste is required. Adjustments to minimum cement concrete for aggregates other than 40mm nominal maximum size aggregate as per IS : 456 : 2000.

Nominal maximum aggregate size (mm)	Adjustment to minimum cement content (kg/m^3)
10	+ 40
20	0
40	– 30

49. Reinforced concrete is advantageous because of its:
(a) fire resistance and durability
(b) less maintenance cost
(c) monolithic character
(d) all of above

RRB JE (Muzaffarpur) 14.12.2014

Ans. (d) : Reinforced concrete as an economic building material, is resist many types of loading. Concrete resists compression and steel reinforcement resists tension forces.
Advantages of Reinforced Concrete–
- The monolithic character of reinforced concrete gives it more rigidity.
- Maintenance cost of RCC is practically nil.
- It has good resistance to damage by fire and weathering (because of concrete)
- It is durable and RCC prevent steel from rusting.

50. The Modulus of Elasticity (E) of concrete as per IS 456 : 2000 is given by (notations are conventional)
(a) $E = 1000\ f_{ck}$ (b) $E = 5000\sqrt{f_{ck}}$
(c) $E = 5500\sqrt{f_{ck}}$ (d) $E = 10000\sqrt{f_{ck}}$

RRB JE (Bilaspur/Guwahati) 14.12.2014

Ans : (b) • Modulus of elasticity of concrete
As per IS code 456 : 2000 $\boxed{E_c = 5000\sqrt{f_{ck}}}$
As per IS code 456 : 1978 $\boxed{E_c = 5700\sqrt{f_{ck}}}$

• Tensile strength / flexural strength / modulus of rupture of concrete in flexure.

$$F_{cr} = 0.7\sqrt{f_{ck}}$$

f_{ck} = Characteristic strength of concrete (MPa)

51. Lateral ties in RCC columns are provided to resist

(a) Bending moment
(b) Shear
(c) Bucking of longitudinal steel bars
(d) Both Bending moment and shear

RRB JE (Bilaspur/Guwahati) 14.12.2014

Ans : (c) • The role of lateral ties is to prevent premature buckling of bars, improve strength, to provide resistance against shear and torsion, to hold bars in position during construction etc.

52. In a Cantilever beam carrying gravity load, main reinforcement to resist Bending moment is provided

RRB JE (Bilaspur/Guwahati) 14.12.2014

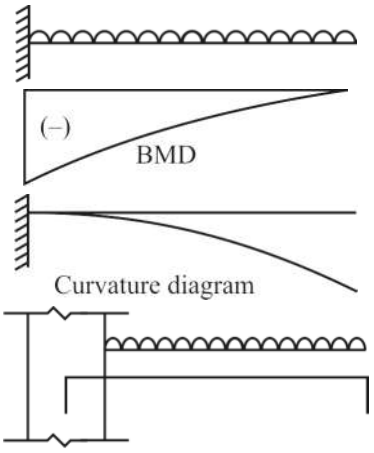
Or

In a cantilever beam, the major reinforcement is provided:

JSSC JE (GEN. ENGG.)- 31.10.2022

(a) above the neutral axis
(b) as vertical stirrups
(c) as a helical reinforcement
(d) below the neutral axis

Ans. (a) : The cantilever beam carry gravity load, top fibers above neutral axis are subjected to tensile stresses so main reinforcement is provided above the neutral axis.



53. In a pre–stressed concrete member, it is advisable to use:

(a) low strength concrete only
(b) high strength concrete only
(c) low strength concrete but high tensile steel
(d) high strength concrete and high tensile steel

RRB JE (Chennai) 14.12.2014

Ans. (d) : High strength concrete is necessary for the following reasons–

- When the stress is transferred to concrete by bond action, the high strength concrete offers high bond stress.
- Shrinkage cracks will be very little.
- Due to the larger modulus of elasticity of high strength concrete, the elastic and creep-strain are small resulting in smaller loss of pre-stress in the steel reinforcements.

54. If tensile stresses in concrete are neutralised by introducing initial compressive stresses, such concrete is known as

(a) Reinforced cement concrete
(b) Prestressed cement concrete
(c) Fiber-reinforced cement concrete
(d) Prefabricated cement concrete

MPSC AE PRE -09.07.2017

Ans. (b) : Prestressed cement concrete–If tensile stresses in concrete are neutralized by introducing initial compressive stresses, such concrete is known as prestressed cement concrete.

55. What is the ratio of modulus of elasticity of steel and modulus of elasticity of concrete?

(a) Young modulus
(b) Poisson's ratio
(c) Modular ratio
(d) None of above

MPSC AE PRE -27.03.2021

Ans. (c) : Modular ratio–It is defined as the ratio of modulus of elasticity of steel (E_s) to that of concrete (E_c)

$$\text{Modular ratio (m)} = \frac{E_s}{E_c}$$

Poisson's ratio–The Poisson ratio is defined as the ratio of transverse strain to the longitudinal strain under an axial load. It is denoted by μ. The value of poisson ratio for steel within the elastic region range from 0.25 to 0.33.

56. In pre-stressed concrete high strength concrete and steel are desirable because :

(a) Results in smaller cross-section
(b) High bearing stresses are generated in anchorage zones
(c) The shrinkage cracks are reduced
(d) All of the above

MPSC AE PRE -27.03.2021

Ans. (d) : In pre-stressed concrete high strength concrete and steel are desirable because–

• The smaller cross-section of member results in smaller self weight.

• High bearing stresses are generated in anchorage zones

• The shrinkage cracks are reduced, with higher modulus of elasticity and smaller creep strain.