



ZONE TECH

Best Institute For Assistant & Junior Engineer

Civil Engineering

Test - 2

RSSB (JE) Diploma Test Series - 2024

Answer key & Detailed Solution

Test ID : 902

Date:- 29/09/2024

Duration : 80 Minutes

Maximum Marks : 80

1. (c) 26. (c)
2. (d) 27. (d)
3. (b) 28. (c)
4. (b) 29. (a)
5. (b) 30. (b)
6. (b)
7. (d) 31. (a)
8. (a) Asbestos is a group of fibrous minerals used to strengthen and fireproof materials
9. (a)
 - Blue Asbestos, also called Crocidolite, is used for insulating steam engines. Besides, it also finds applications in pipes and cement products.
 - Asbestos Cement contains Chrysotile, also called white asbestos. Notably, Chrysotile is less hazardous as compared to other varieties of Asbestos
 - Amosite is Also Known as Brown Asbestos
10. (c)
11. (a)
12. (d)
13. (b)
14. (c) 32. (a)
15. (b) **Properties of Asbestos**
16. (b) The various properties of Asbestos that make it a viable engineering material are enumerated under
17. (d) (a) Asbestos has a high tensile strength.
18. (a) (b) It is a superior electrical insulator.
19. (c) (c) Due to its incombustibility, it serves as a good heat insulator.
20. (a) (d) It resists attacks by acids.
21. (b) (e) It is non-porous, soft, and elastic.
22. (a) (f) Its melting point ranges from 1200 to 1500 °C, and it is fire-resistant.
23. (b) (g) Since it adheres well to cement, the fibre can be utilized as a fibre reinforcement.
24. (d) (h) It is resistant to rusting.
25. (d) (i) It has a specific gravity of 3.1.
- (j) It is simple to cut into pieces.
- (k) The length of the fibres has a significant impact on their quality.
- (l) It has a silky and glassy smoothness.

33. (d)

Rapid Curing (RC)

The solvent used in rapid curing cutback bitumen can be naphtha or gasoline,

The Bureau of Indian Standards (BIS) further classifies Rapid curing bitumen into 4 types:

RC 70, RC 250, RC 800, and RC 3000.

Note: RC 70 can be used without heating, while RC 3000 and RC 800 cannot be applied at low temperatures.

34. (a)

As per IS 15489: 2004:

1. Maximum Surface drying time for class A and Class B type plastic emulsion paint is 45 minutes.
2. Maximum Surface drying time for class C and Class D type plastic emulsion paint is 90 minutes.
3. Maximum Hard drying time for class A and class B type plastic emulsion paint is 240 minutes.
4. Maximum Hard drying time for class C and class D type plastic emulsion paint is 480 minutes.

35. (b)

- **Cass test**

It is performed to determine the corrosive performance of metals or other products using salt spray testing. Chemical Analysis of paint and coating to check whether the product reacts to any chemical substances or not.

- **Conditioning Tests**

These are conducted to determine the behaviour and reaction of paints and other kinds of coatings to exposure to various conditions of humidity, and temperature defined in relation to requirements of product or coating specifications.

36. (d)

CLASSIFICATION OF VARNISH ARE :

Long oil varnish

- Long oil contains 40 to 100 gal of oil per 100 lbs of resin.
- Takes a longer time to dry
- Moderate gloss
- Marine and spar varnish belong to this group
- Tung oil used is impervious to water

Medium oil varnish

- Medium oil contains 12 to 40 gal of oil per 100 lbs of resin
- They dry faster and become harder
- Harder film than long-oil varnish but are not impervious to water
- Floor varnish belongs to this group

Short oil resin

- Short oil contains 5 to 12 gal of oil per 100 lbs of resin.
- Dry rapidly forms a hard, brittle film that withstands much rough usage.
- Polishing varnish belongs to this group

37. (a)

8ft x 4ft laminate is the most widely used option. The popularity of the 8ft x 4ft sheet can be attributed to its convenience, cost-effectiveness, and ease of use & transportation.

38. (a)

Drag

The jumper is a very essential tools used in quarrying stones by blasting methods. Jumper is used for drilling the blasts hole of the required diameter and depth in which explosive is placed for blasting, so as to loosen the large rock blocks.

Drag is used to make a level surface and Gad is used to split the stones.

39. (d)

Mottling in stone is a patchy or blotchy texture that can be caused by bioturbation and is often found in limestone.

A vent defect in stone can occur when a vent is installed directly into mortar, which can cause it to break loose and allow moisture or pests to get in. This is because mortar is not flexible, so it can't handle the movement of the home or thermal movement.

A shake defect in stone can refer to a crack or separation in stone that occurs when it is shaken.

40. (b)

IS Code Specification for Cement

IS 8041 : 1990	Specification of Rapid Hardening Cement
IS 269 : 2013	Specific for 33 Grade ordinary Portland Cement
IS 8112 : 2013	Specification for 43 Grade Ordinary Portland Cement
IS 12269 : 2023	Specification for 53 Grade Ordinary Portland Cement
IS 12600 : 1989	Specification for Low Heat Portland Cement
IS 455 : 1989	Specification for Portland Slag Cement

41. (b)

IS Code for Bricks

3495 (Part-I)	Compressive Strength Test
IS 3495 (Part-II)	Water Absorption test
IS 3495 (Part-III)	Efflorescence test for Bricks
IS 3495 (Part-IV)	Warpage test for Bricks.

42. (d)

• **Le-Chatelier method**

This method involves heating a cement sample to determine its expansion and the risk of late expansion. The Le-Chatelier test can detect unsoundness due to free lime.

• **Autoclave method**

This method applies pressure to a sample of hardened cement paste to measure its expansion.

43. (b)

Blast Furnace Slag (BFS) cement is the combination of Ordinary Portland Cement (OPC) and fine Granulated Blast Furnace Slag (GBFS) gained as a byproduct in the steel-making manufacturer with below 70% that of cement.

Portland Pozzolana Cement (PPC) is a type of blended cement comprising Portland clinker, pozzolana particles and gypsum in certain specific proportions.

Pozzolana or pozzolans are particles that contain constituents which when combined with lime and water forms compounds that possess cementing properties.

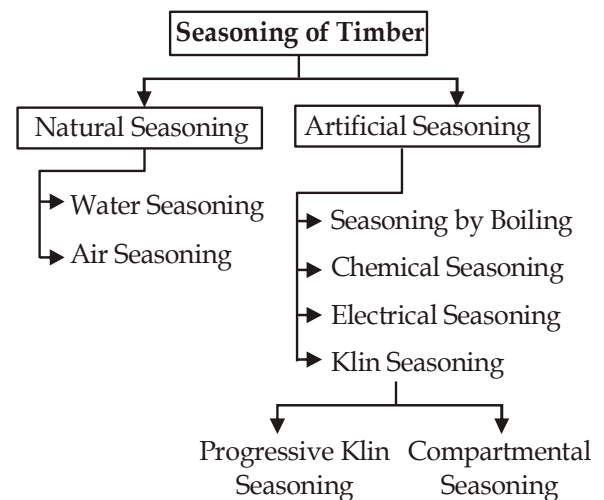
High alumina cement, also known as calcium aluminate cement (CAC) or refractory cement, is a type of hydraulic binder that is manufactured by grinding alumina (Al₂O₃) and limestone (CaCO₃) together and then firing the mixture at a high temperature. It has a high alumina content, typically ranging from 40% to 80%, which gives it excellent heat resistance and refractory properties.

44. (b)

Cement type	Specific gravity
Ordinary Portland cement	3.15
Portland-blast-furnace-slag and portland-pozzolana cements	Near 2.90

45. (b)

Seasoning is the process of removing moisture from freshly cut timber to prevent it from warping, twisting, or breaking while being used in construction and other engineering applications.



46. (d)

Plywood is specified by multiple factors, including:

- Number of layers
Plywood is made up of thin layers of wood, or veneers, that are glued together in an odd number, usually between 3 and 13. The layers are placed in a way that their grains are at right angles to each other, which increases the plywood's strength.
- Grade
Plywood is identified by the quality of the veneer used to make it. There are six main grades of plywood, and each veneer has two grades.
- Size
Plywood is typically measured in standard units, with the most common sizes being 4 x 8 and 5 x 5 feet. Softwood plywood is also available in sizes of 2 x 2 feet, 2 x 4 feet, and 4 x 4 feet.

47. (b)

Based on the durability, timber is classified as follows:

- (a) **High durability:** Average life on 10 years and above.
- (b) **Moderate durability:** Average life of fewer than 10 years but if 5 years or more.
- (c) **Low durability:** Average life of fewer than 5 years.

48. (b)

Non-refractory timbers are resinous and catch fire easily. Some examples of non-refractory timbers include: chir, deodar, and fir.

Refractory timbers are non-resinous and don't catch fire easily. Some examples of refractory timbers include: sal and teak.

Timbers can be made more fire resistant by coating them with a dilute solution of sodium silicate.

49. (c)

In India, bricks are typically used in one of four standard sizes.

- Modular/metric bricks: 190 × 90 × 90 mm. These bricks are made by machines.
- Non-modular bricks: 230 mm × 110 mm × 70 mm.
- English size bricks: 230 × 115 × 75 mm, or 9 in. × 4.5 in. × 3 in
- Traditional bricks: 230 × 110 mm.

50. (b)

Calculation of Water Absorption of Bricks

Water absorption, % by mass, after 24 hours immersion in cold water is given by the formula,

$$W = \frac{M_2 - M_1}{M_1} \times 100$$

When tested as above, the average water absorption shall not be more than 20% by weight up to class 12.5 and 15% by weight for higher class.

51. (b)

According to Indian practice the weight of a brick is kept between 3- 3.5 kg. Depending upon the class of brick.

Brick is obtained by moulding good clay into a block, which is dried and then burnt. This is the oldest building block to replace stone. Manufacture of brick started with hand moulding, sun drying and burning in clamps.

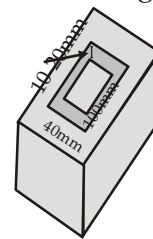
52. (d)

A pug mill, also known as a pug mixer.

Pug mills are used to mix clay and other materials into a plastic state to prepare it for brick making.

53. (c)

Brick Frog Size



54. (d)

Efflorescence is a crystalline, salty deposit that occurs on the surfaces of bricks, concrete and other masonry products.

It is white, sometimes a brilliant white or an off white colour.

In order for efflorescence to occur, there must be water present to dissolve and transport the salts to the brick surface

55. (d)

When a brick starts to fall apart as evidenced by a flaking surface and begins to literally disintegrate, this is known as spalling

Spalling occurs when moisture from rain, melting snow, or even wet soil saturate and penetrate the brick

When the moisture inside the brick freezes, it expands and begins to crack the brick

With repeated freezing and thawing, the fractures widen until the brick actually begins to fall apart

56. (c)

Bricks are burned at high temperature to gain the strength, durability, density and red colour appearance.

All the water is removed at the temperature of 650°C but they are burnt at a temperature of about 1100°C because the fusing of sand and lime takes place at this temperature and chemical bonding takes between these materials after the temperature is cooled down resulting in the hard and dense mass.

Bricks are not burnt above this temperature because it will result in the melting of the bricks and will result in a distorted shape and a very hard mass when cooled which will not be workable while brickwork.

57. (b)

Dummy activity:

- It is a type of activity in the network which neither consumes any time nor resource.
- It is an artificial activity.
- It is represented by a dashed arrow and identified by the terminal node or event to which it connects.
- It maintains the uniqueness of the activity
- It acts as a connecting link for control purposes.

58. (b)

$$\begin{aligned} \text{Expected Time } T &= \frac{(t_0 + t_p + 4t_m)}{6} \\ &= \frac{(22 + 50 + 4 \times 30)}{6} \\ &= \frac{192}{6} = 32 \end{aligned}$$

59. (b)

Activity:

- All projects may be viewed as being composed of operations or tasks called activities which require the expenditure of time and resources for their accomplishment.
- An activity is depicted by a single arrow (?) on the project network. The activity arrows are called arcs.
- The activity arrow is not scaled, the length of the activity time is only a matter of convenience and clarity, and does not represent the importance of time.
- The head of the arrow shows the sequence or flow of activities.
- An activity cannot begin until the completion of its preceding activities.

60. (b)

The organizational structure has Five tier hierarchy i.e., Chief Engineer, Superintending Engineer, Executive Engineer, Assistant Engineer and Junior Engineer.

The administrative head of the public works department who is directly responsible to the government is the Chief Engineer.

61. (a)

Mile Stone chart:

- It is a modification over the original Gantt chart (Bar Chart). Milestone is key events of main activities represented by the bar. Therefore they give an idea about the completion of sub-activities.
- Controlling can be better achieved with the help of milestone charts. But still, activity interrelationship and accountability of time uncertainty can not be depicted which can be overcome in-network technique.

62. (c)

Uses of Building Stones

The stones used for various types of works are as follows:

- Fine-grained granite and gneiss stones are used for Heavy engineering works such as building bridge piers, breakwaters, monuments, etc.
- Granite, quartzite are used for masonry works in industrial areas exposed to smoke and fumes.
- Marble, granite and sandstone are used for facing work of buildings.
- Limestone and sandstone are used for general building works.

63. (c)

Siliceous rocks are sedimentary rocks that have silica (SiO_2) as the principal constituent. The most common siliceous rock is chert and other types include diatomite. They commonly form from silica-secreting organisms such as radiolarians, diatoms, or some types of sponges.

64. (a)

Course: A course is a horizontal layer of bricks or stones.

Header: It is a brick or stone which lies with its greatest length at right angles to the face of the work. In case of stone masonry header is sometimes known as through stone. The course of brick work in which all the bricks are laid as headers is known as header course.

Stretcher: It is a brick or a stone which lies with its longest side parallel to the face of the work. The course of brick work in which all the bricks are laid as stretchers is known as stretcher course.

Arrises: The edges formed by the intersection of plane surface of brick are called the arrises and they should be sharp, square and free from damage.

65. (b)

The standard consistency of a cement paste is defined as that consistency that will permit a Vicat plunger having 10 mm diameter and 50 mm length to penetrate to a depth of 33-35 mm from the top of the mould.

Consistency of cement is conducted by Vicat Apparatus.

The normal consistency of ordinary Portland cement is between 25 - 30%.

66. (a)

By increasing the fineness of cement, the strength development of cement is increased. So, fineness of cement is directly proportional to the development of strength of cement.

67. (a)

Classification of the tree:

For engineering purposes, the trees are classified according to their mode of growth.

Endogenous tree:

- These trees grow inwards.
- Timber from these trees has very limited engineering applications.
- Examples of endogenous trees are bamboo, cane, palm, etc.

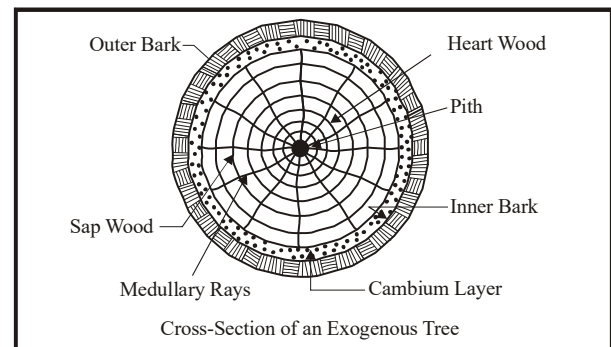
Exogenous tree:

- These trees grow outwards, increasing in bulk with the formation of the ring every year.
- These annual rings are used for predicting the age of the tree.
- These trees are mostly used for engineering work.
- They are further divided into conifers and deciduous.

68. (b)

Wood and metal surface require 3 coats of plastering so that the surface is completely safe and sealed. Stone and brick masonry generally require 2 coats and a single coat is done for low cost construction

69. (b)



70. (b)

- Varnish is a nearly homogeneous solution of resin in oil, alcohol or turpentine.
- The type of solvent depends upon the type of resin used.
- Oil-based varnish is the most durable finish that can be easily applied by the average woodworker.
- Driers are added to oil bound paints to accelerate drying process.
- Litharge and lead acetate are used as drier in varnish.

71. (c)

- Distemper is made with base of 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 surfaces as well as white-washed surfaces of interior walls.
- Oil-bound washable distemper, washable oil free distemper, and nonwashable distemper or emulsion paints are some of the types of distemper.

72. (c)

The common defects in paints are:

1. **Blistering and Peeling:** Blistering and peeling are defects in which swelling of the paint film occurs caused by the formation of an air bubble under the paint film due to the presence of moisture or oil or grease matter. If it is due to moisture then it is called peeling and if it is due to oil and grease matter then it is called blistering.
2. **Fading:** Fading is the discoloration of the paint surface due to atmospheric agencies such as sunlight, and moisture.
3. **Grinning:** The visibility of the background due to insufficient opacity of paint film even after the final coat is called grinning.
4. **Chalking:** Chalking is the formation of powder on the painted surface. This is due to the use of insufficient oil in the primer.
5. **Flaking:** The detachment of paint film from the surface is called flaking. It occurs when the bond between surface and paint film is poor.

73. (a)

Putty is cementing material made of whiting (finely powdered calcium carbonate) and boiled linseed oil. It is beaten or kneaded to the consistency of dough.

74. (d)

Dry rubble masonry: The rubble masonry in which stones are laid without using any mortar is called dry rubble masonry or sometimes shortly as "dry stones". It is an ordinary masonry and is recommended for constructing walls of height not more than 6 m.

Three types of Rubble Masonry are as follows:

(a) **Un-coursed Random Rubble Masonry:** The random rubble masonry in which stones are laid without forming courses is known as un-coursed random rubble masonry. This is the roughest and cheapest type of masonry and is of varying appearance.

It is used for the construction of walls of low height in the case of ordinary buildings.

(b) **Coursed Random Rubble Masonry:** The random rubble masonry in which stones are laid in layers of equal height is called random rubble masonry. In this masonry, the stones are laid in somewhat level courses. Headers of one coursed height are placed at certain intervals. The stones are hammer dressed.

(c) **Squared Rubble Masonry:** The rubble masonry in which the face stones are squared on all joints and beds by hammer dressing or chisel dressing before their actual laying is called squared rubble masonry.

75. (b)

English Bond

- This bond consists of headers and stretchers laid in alternative courses.
- It is strongest of all the bonds.
- In stretcher course, the stretcher have a minimum lap of one fourth of their length.
- Dutch bond is modification over English bond.
- Each header course consist queen closer to avoid vertical joint in same line.
- The hearting of wall completed by header entirely.
- The joint in header course thinner than joint in stretcher course.

76. (b)

The stones which have a crushing strength greater than 1000 kg/cm² are considered as the good building materials.

Crushing strength or compressive strength of a stone is the load per unit area at which the stone starts cracking.

77. (d)

Bethel process is a standard procedure to treat timbers with creosote oil using the full-cell process to protect the timbers from marine borers. Creosote oil is prepared by the distillation of tar. It is black or brown in colour.

Working process of Creosote Oil

Firstly, the timber is well seasoned and dried. Then, it is placed in airtight chamber and inside air is pumped out.

Finally creosote oil is pumped into the chamber with high pressure about 0.7 to 1 N/mm² at a temperature of 50°C.

After allowing it for 2 hours, the timber absorbs creosote oil sufficiently and taken out from the chamber.

Creosote oil is flammable so, it is not used for timber works in fire places. It is generally used for wood piles, poles, railway sleepers etc.

78. (d)

According to IS : 4031 (Part 5) - 1988,

In order to find initial setting time, final setting time, soundness and strength characteristics of cement a parameter called standard consistency is used. Test for it is performed at 27 ± 2°C and relative humidity of 65±5%

79. (c)

Diorite rock is an example of intrusive igneous rock

Intrusive igneous rocks:

- Igneous rocks made from cooling of solidification of magma.
- When magma is cooling below earth surface, (cooling rate is slow) then intrusive rock is formed.

Ex. Diorite, Granite, Pegmatite, Peridotite, etc.

Extrusive igneous rocks

- When magma is reached earth surface, then it is called lava.
- When lava is cooling and they cool quickly to form small crystals, then extrusive igneous rock is formed.

Eg. Basalt, Dacite, Pumice, Rhyolite, etc.

80. (d)

Defects due to	Defects
1. Insect	Tunnels inside 2 mm diameter pin holes, etc.
2. Natural forces	Knots, shakes, foxiness, druxiness, burls (rind galls), coarse grain, etc
3. Fungi	Brown rot, dry rot, white rot, wet rot.
4. Conversion	Chip mark, diagonal grain, torn grain, wane, etc.