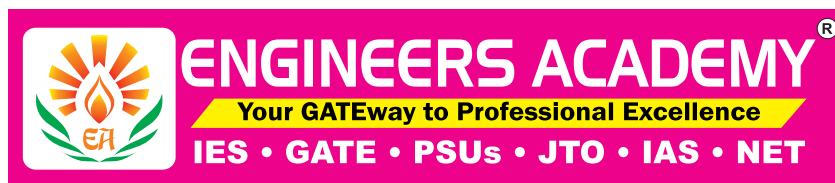SMART EDITION

**2**
VOLUME

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# CONTENTS

# Unit-I

# Building Materials and Construction

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# BRICKS

## OBJECTIVE QUESTIONS

1. The process of mixing sand with the powdered natural soil to improve the quality is known as
   (a) Moulding          (b) Tempering
   (c) Drying             (d) Blending

2. Lime is mixed with brick earth
   (a) To impart plasticity
   (b) To increase durability
   (c) To prevent shrinkage
   (d) To increase impermeability

3. Maximum percentage of water absorption of II-class bricks in 24 hours should be limited to
   (a) 10%               (b) 15%
   (c) 20%               (d) 22%

4. The over ground continuous kiln is
   (a) Bull's trench kiln  (b) Hoffman's kiln
   (c) Tunnel kiln        (d) All of these

5. Fire bricks should be laid in
   (a) Lime mortar        (b) Fire cement mortar
   (c) Fire clay mortar   (d) All of these

6. Bullnose bricks are not used in
   (a) Walls
   (b) Rounding off sharp corners
   (c) Arches
   (d) Pillars
   **[RPSC-AE – 2018]**

7. If rain water falls on hot bricks, then shape of the bricks gets deformed, the defect is known as
   (a) Efflorescence      (b) Bloating
   (c) Chuffs             (d) Nodules

8. Hollow brick is
   (a) Sound proof
   (b) Heat proof
   (c) About 1/3 in weight of standard brick
   (d) All of the above

9. The compressive strength of burnt clay bricks as per IS 1077-1992 is
   (a) 105 kg/cm$^2$       (b) 150 kg/cm$^2$
   (c) 105–150 kg/cm$^2$   (d) 35–350 kg/cm$^2$
   **[Punjab - SSSB]**

10. Consider the following statements:
    A good soil for making bricks should contain
    1. About 30% alumina.
    2. About 10% lime nodules.
    3. A small quantity of iron oxides, 5 to 6%.
    4. About 5% magnesia.
    Of these statements
    (a) 1 and 2 are correct
    (b) 1 and 3 are correct
    (c) 1, 3 and 4 are correct
    (d) 1 and 4 are correct

11. Consider the following statements:
    For the manufacture of good quality bricks it is essential to
    1. Use a reverberatory kiln.
    2. Blend the soil with clay or sand as deemed appropriate.
    3. Knead the soil in a ghani.
    4. Temper the soil in a pug mill.
    Of these correct statements are
    (a) 1 and 3             (b) 2 and 4
    (c) 1, 3 and 4          (d) 2, 3 and 4

12. The raw bricks shrink during drying and warp during burning because of
    (a) Less lime in brick earth
    (b) Less silica and excess magnesia in brick earth
    (c) Excess of alumina
    (d) Alkalies in bricks earth
    **[UKESE – 2017]**

13. In brick masonry the frog of the brick is generally kept on
    (a) Top face        (b) Bottom face
    (c) Exposed face    (d) Interior face
    **[JPSC-AE, Punjab JE - 2014,**
    **PHED-RAJ., Chandigarh JE - 2016]**

14. The approximate weight of a brick should be
    (a) 2.5 kg        (b) 4.5 kg
    (c) 5.1 kg        (d) 3.2 kg
    **[Punjab JE - 2014,**
    **PEB.SUB ER. - 2017, DMRC - 2018]**

15. Which one is the correct sequence of various operations of preparation of Brick-Earth. I. Blending II. Digging III. Weathering IV. Unsoiling V. Tempering
    (a) IV, II, III, V, I    (b) IV, II, III, I, V
    (c) II, IV, V, III, I    (d) II, III, IV, V, I
    **[RPSC]**

16. What is the nominal size of standard modular brick-tile?
    (a) 19 cm × 9 cm × 4 cm
    (b) 19 cm × 9 cm × 9 cm
    (c) 20 cm × 10 cm × 10 cm
    (d) 20 cm × 10 cm × 5 cm
    **[PEB-SUB ER. - 2017]**

17. What is the unit weight of broken bricks ?
    (a) 1520 kg/m³        (b) 1630 kg/m³
    (c) 1800 kg/m³        (d) 1420 kg/m³
    **[PEB-SUB ER. - 2017]**

18. The compressive strength of first class bricks should not be less than
    (a) 7 N/mm²        (b) 10.5 N/mm²
    (c) 12 N/mm²        (d) 15 N/mm²
    **[UJVNL – 2021, JPSC - AE]**

19. The term 'frog' means :
    (a) An apparatus to lift the brick
    (b) Soaking brick in water
    (c) A depression on the face of the brick
    (d) Vertical joint in a brick work
    **[PEB-SUB ER. - 2017,**
    **LMRC JE, AEC-2017]**

20. How many bricks will be required for 1 cubic meter of brick masonry?
    (a) 100        (b) 500
    (c) 250        (d) 400
    **[JPSC-AE, PEB-SUB ER. - 2017,**
    **Punjab JE – 2014, ISRO - 2013, MPSC - 2012]**

21. Efflorescence is
    (a) Formation of white patches on the surface of bricks due to the presence of insoluble salts in the clay used for making bricks
    (b) Swelling of bricks due to the presence of carbonaceous matter and gas
    (c) Deformation arising out of exposure to the weather
    (d) Presence of impurities in the clay used for making bricks that show up after burning
    **[GESCOM-AE, PMB- JE - 2018]**

22. Jhama bricks are
    (a) Under burnt        (b) Over burnt
    (c) Not burnt          (d) None of these
    **[KPSC-AE, KPSC-JE]**

23. What is the content of clay and silt in good brick earth ?
    (a) 20%        (b) 30%
    (c) 40%        (d) 50%
    **[KPSC-AE, JPSC-AE]**

24. The presence of excess alumina in the clay is reflected in the bricks as

    (a) Makes the bricks brittle and weak

    (b) Makes the bricks crack and warp on drying

    (c) Changes the colour of the brick from red to yellow

    (d) Improves impermeability and durability of the brick

    **[KPSC-JE]**

25. Water absorption for I$^{st}$ class bricks should not be more than _____ .

    (a) 12%　　　　　(b) 15%

    (c) 20%　　　　　(d) 25%

    **[KPSC-JE, JPSC-AE, ISRO - 2013]**

26. Which of the following constituent in earth gives plasticity to mould bricks in suitable shape?

    (a) Silica　　　　(b) Lime

    (c) Alumina　　　(d) Magnesia

    **[KPSC-JE]**

27. Bricks are burnt at a temperature range of _____

    (a) 500 – 700°C　　(b) 700 – 900°C

    (c) 900 – 1200°C　(d) 1200 – 1500°C

    **[KPSC-JE]**

28. The standard size of modular brick including mortar thickness is

    (a) 23 cm × 12 cm × 8 cm

    (b) 19 cm × 20 cm × 19 cm

    (c) 20 cm × 10 cm × 10 cm

    (d) 18 cm × 9 cm × 9 cm

    **[KPSC-JE]**

29. A good brick earth should, in general, contain

    (a) About 20% to 30% of alumina

    (b) About 50% to 60% of silica

    (c) Not more than 5% of lime

    (d) All of the above

    **[KPSC-JE]**

30. In which of the following areas would refractory bricks be used?

    (a) Retaining walls

    (b) Columns

    (c) Piers

    (d) Combustion chambers

    **[KPSC-JE]**

31. What is the standard size of masonry bricks ?

    (a) 21 cm × 11 cm × 11 cm

    (b) 20 cm × 10 cm × 10 cm

    (c) 19 cm × 9 cm × 9 cm

    (d) 18 cm × 8 cm × 8 cm

    **[KPSC-JE, JPSC-AE, TNPSC, Punjab-SSSB, MPSC - 2012, ISRO - 2013]**

32. The main ingredient of a good quality brick earth is

    (a) Magnesia　　　(b) Lime

    (c) Silica　　　　(d) Alumina

    **[KPSC-JE, RPSC]**

33. Presence of which of the following is responsible for imparting yellow tint to bricks?

    (a) Silica　　　　(b) Alumina

    (c) Lime　　　　　(d) Magnesia

    **[TSPSC-AE - 2015, DFCCIL - 2016]**

34. The strength achieved by a brick depends on

    (a) Composition of brick earth

    (b) Nature of moulding adopted

    (c) Burning and cooling process

    (d) All of the above

    **[MPSC - 2012]**

35. The red colour of bricks is due to :

    (a) Iron oxide　　　(b) Silica

    (c) Magnesia　　　(d) Alumina

    **[NBCC - 2017]**

36. The recommended compression strength of A class Brick as per BIS is :

    (a) 25 N/mm$^2$　　　(b) 20 N/mm$^2$

    (c) 14 N/mm$^2$　　　(d) None of these

    **[NBCC - 2017]**

37. Excess of silica in brick earth causes
    (a) Loss of cohesion
    (b) Impermeability
    (c) Cracking and warping on drying
    (d) None of the above
    **[Chandigarh JE - 2016]**

38. A pug mill is used for
    (a) Moulding of brick earth
    (b) Baking of bricks
    (c) Tempering of brick earth
    (d) Testing of bricks
    **[ISRO - 2018]**

39. Which tool is used for cutting bricks accurately?
    (a) Bolster       (b) Trowel
    (c) Brick Hammer  (d) Rammer
    **[Haryana JE - 2018]**

40. Fire bricks are made from
    (a) Fire clay      (b) Quick lime
    (c) Hydrate lime   (d) Cement

41. Which one of following is not a defect in bricks?
    (a) Wedge cut      (b) Under burning
    (c) Over burning   (d) Black core
    **[DMRC - 2018]**

42. In the manufacturing process of bricks, which moulding is not practiced?
    (a) Ground moulding
    (b) Table moulding
    (c) Automatic moulding
    (d) Machine moulding
    **[DMRC - 2018]**

43. A frog in a brick is provided to mainly serve which of the following purposes?
    (a) Emboss builder's name
    (b) Reduce the weight of brick
    (c) Improve insulation by providing hollows
    (d) Form keyed joint between brick and mortar
    **[JPSC-AE, PPSC – 2021,**
    **Punjab-SDO – 2021, AEC - 2017]**

44. The average compressive strength of 2nd class bricks should not be less than
    (a) 75 kg/cm$^2$   (b) 12 kg/cm$^2$
    (c) 10 kg/cm$^2$   (d) 15 kg/cm$^2$
    **[AEC - 2017]**

45. The following soil is good for making bricks
    (a) Black cotton   (b) Silty
    (c) Alluvial       (d) Sand and silt
    **[RPSC ACF - 2011]**

46. The percentage of perforation in solid bricks is about
    (a) 5              (b) 10
    (c) 15             (d) 20
    **[RPSC ACF - 2011]**

47. The tolerance in the width of the mould of a class I brick is about
    (a) ± 3 mm         (b) ± 6mm
    (c) ± 10 mm        (d) ± 12 mm
    **[RPSC ACF - 2011]**

48. The percentage of alumina in a good brick clay should be lies between
    (a) 20% – 30%      (b) 30% – 40%
    (c) 40% – 50%      (d) 50% – 60%
    **[DSSSB JE - 2015, Bihar JE - 2016]**

49. If L is the length and B the width of the brick and t the thickness of mortar, the relation between these is
    (a) L = 2B         (b) L = B + t
    (c) L = B + 2t     (d) L = 2B + t

50. Which of the following ingredients of the brick earth enables the brick to remain its shape?
    (a) Alumina        (b) Silica
    (c) Iron           (d) Magnesia
    **[RPSC ACF - 2011]**

51. Glazing is used to make earthenware
    (a) Hard           (b) Soft
    (c) Porous         (d) Impervious
    **[RPSC ACF - 2011]**

**52.** Bauxite bricks are

(a) Ordinary fire bricks

(b) Basic refractory bricks

(c) Acid refractory bricks

(d) Neutral refractory bricks

**[Haryana SSC JE - 2015]**

**53.** Refractory bricks resist

(a) High temperature

(b) Chemical action

(c) Dampness

(d) All of the above

**[JPSC-AE, HPSC AE - 2010]**

**54.** According to IS-1077, class-10 bricks are the bricks having_____.

(a) Thickness more than 10 cm

(b) Tensile strength not less than 10 N/cm$^2$

(c) Compressive strength not less than 10 N/mm$^2$

(d) Length more than 10 cm

**[MP VYAPM - 2017]**

**55.** Match the Grade of bricks with its compressive strength (According to IS : 1077 - 1992) and select the correct answer as per the codes given below.

| Compressive Strength | Grade |
|---|---|
| A. Not less than 140 kg/cm$^2$ | I. Grade A |
| B. Not less than 105 kg/cm$^2$ | II. Grade A-A |
| C. Not less than 70 kg/cm$^2$ | III. Grade B |
| D. Not less than 35 kg/cm$^2$ | IV. Grade C |

(a) A-IV, B-II, C-III, D-I

(b) A-I, B-II, C-III, D-IV

(c) A-II, B-I, C-III, D-IV

(d) A-I, B-III, C-II, D-IV

**[DFCCIL - 2016]**

**56.** Which of the following is not mechanical property of bricks?

(a) Modulus of rupture  (b) Texture

(c) Tensile Strength  (d) Fire resistance

**[RJC - 2016]**

**57.** A good brick earth can be rolled without breaking in small thread of diameter:

(a) 1 mm  (b) 3 mm

(c) 6 mm  (d) 10 mm

**[RJC - 2016]**

**58.** For checking the length of bricks as per Indian standards how many bricks are to be taken:

(a) 10  (b) 15

(c) 20  (d) 25

**[UKSSSC – 2017 (Draftman), UP JAL NIGAM JE - 2013 , UP SSC JE - 2015]**

**59.** Which of the following statement is INCORRECT with respect to first class bricks?

(a) No impression should be left on the brick when a scratch is made by a finger nail

(b) A metallic or ringing sound should come when two bricks are struck against each other

(c) Water absorption is about 25-30% of its dry weight is allowed

(d) These should be free from flaws, cracks and stones

**[MP SUB ER. - 2017]**

**60.** The function of iron oxide in brick is to _____.

(a) Impart uniform shape

(b) Prevent shrinkage of raw bricks

(c) Impart colour

(d) Impart plasticity to the brick

**[Draughtsman-Bihar - 2016]**

**61.** Percentage of silica in a good brick earth lies between

(a) 5 to 10%  (b) 20 to 30%

(c) 50 to 60%  (d) 70 to 80%

**[UP JAL NIGAM JE - 2017, UPRVUNL JE - 2015, Punjab JE – 2015]**

**62.** The average crushing and tensile strength of hand moulded bricks in kN/m$^2$ is:

(a) 60000 and 2000  (b) 50000 and 1000

(c) 55000 and 1500  (d) 65000 and 2500

**[UPRVUNL JE - 2016]**

**63.** What happens of the constituents of brick, when a raw brick is heated in the temperature range of 700-1000 degree C?

(a) Physical changes (b) Chemical changes

(c) Dehydration (d) Colouring of brick

**[CPEB - 2016]**

**64.** The minimum compressive strength of a brick is:

(a) 3.5 MPa (b) 7.5 MPa

(c) 10.2 MPa (d) 5.5 MPa

**[JSSC-JE, Punjab - JE, CPEB - 2016]**

**65.** China clay is an example of ............

(a) Kaolinite (b) Illite

(c) Montmorillonite (d) None of these

**[CPEB - 2016]**

**66.** Stone chips or broken bricks are also known as

(a) Scrap (b) Waste

(c) Dust (d) Spall

**[Haryana SSC JE - 2015]**

**67.** Which of the following is an odd one as regards 'requirements of good bricks earth?'

(a) It must be free from lumps of lime

(b) It should not be mixed with salty water

(c) It must be non-homogeneous

(d) It should not contain vegetable and organic matter

**[Haryana SSC JE - 2015]**

**68.** Which class of bricks has the following quality?

1. Soft and have light color.

2. Crumble even on light crushing.

(a) Over burnt bricks

(b) Second class bricks

(c) Under burnt bricks

(d) First class bricks

**[MP VYAPAM - 2016]**

**69.** Frog is provided into the bricks to:

(i) Indicate the manufacture's name

(ii) Provide a key for mortar

Which among these is/are correct?

(a) Only (i) (b) Only (ii)

(c) Both (i) and (ii) (d) Neither (i) nor (ii)

**[UPPCL JE - 2016, LMRC JE - 2015]**

**70.** Excess of _____ is responsible for brick's decay.

(a) Magnesia (b) Alumina

(c) Lime (d) Silica

**[UPPCL JE - 2016]**

**71.** Strength based classification of bricks is made on the basis of

(a) IS : 3101 (b) IS : 3102

(c) IS : 3495 (d) IS : 3496

**72.** Which of the following constituent, present in excess quantity, changes the color of the brick from red to yellow?

(a) Alumina (b) Silica

(c) Lime stone (d) Iron Pyrite

**[UPPSC-AE-2020]**

**73.** Fly ash is residue generated from

(a) Chemical industries

(b) Hydro power plant

(c) Nuclear Power plants

(d) Thermal Power plants

**[RPSC, RPSC-ACF - 2011]**

**74.** Which of the following is not a major constituent of fly-ash?

(a) Aluminum oxide (b) Silica

(c) Ferrous oxide (d) Cobalt oxide

**[GESCOM-AE]**

**75.** The portion of a brick cut across its mid width and having its length equal to that of a full brick, is known as

(a) King closer (b) Cornice Brick

(c) Queen Closer (d) Voussoir

**[Uttarakhand State AE - 2007]**

**76.** A vertical joint on the face of a wall directly over vertical joints in an alternate course is termed as _____.
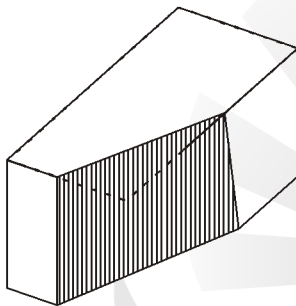
(a) Bed      (b) Bat

(c) Perpend      (d) Mitred Closer

**[MP VYPAM - 2017]**

**77.** The portion of the brick without a triangular corner equal to half the width and half the length is called .........

(a) Closer      (b) Queen closer

(c) King Closer      (d) Squint brick

**78.** In brick masonry following figure indicates which type of closer



(a) King closer      (b) Queen closer

(c) Bevelled closer      (d) Mitred closer

**[MP VYAPAM - 2016]**

**79.** A brick laid with its length perpendicular to the length of the wall is called as

(a) Stretcher      (b) Quoin

(c) Bat      (d) Header

**[MP VYAPAM - 2016]**

**80.** Which type of bond can be made for 10 cm thick wall

(a) English Bond      (b) Flemish Bond

(c) Heading Bond      (d) Stretching Bond

**[UPSSSC JE - 2016]**

**81.** A king closer is

(a) 1/4 of brick      (b) 4/3 of brick

(c) 3/4 of brick      (d) None of these

**[HPSSSB JE - 2017]**

**82.** The term king closer is used in relation to

(a) Doors & windows (b) King post truss

(c) Queen post truss (d) Brick masonry

**[PMB JE - 2018]**

**83.** The position of brick cut to form angles other than right angles in plan, is known as

(a) Queen closer      (b) King closer

(c) Closer      (d) Squint Closer

**[UPRVUNL AE - 2015]**

**84.** Part of brick which has half-header face and half-stretcher face is known as

(a) Bevelled closer      (b) King closer

(c) Queen closer      (d) Bat

**[UPPSC-AE-2020]**

**85.** What is the maximum allowable water absorption (%) of Indian burnt brick of class 20 ?

(a) 15      (b) 5

(c) 10      (d) 20

**[Coal India Ltd. : 2017]**

**86.** Water absorption of a good bricks should NOT exceed_____of its dry weight when kept immersed in water for 24 hours.

(a) 20%      (b) 30%

(c) 25%      (d) 10%

**[DFCCIL : 2018]**

**87.** For walls having thickness of wall more than one and a half brick, the following bond is more compact and stronger :

(a) Double Flemish Bond

(b) English Bond

(c) Garden Wall Bond

(d) Dutch Bond

**[RPSC-AE(Pre) : 2013]**

**88.** Efflorescence in the bricks is caused due to

(a) Lime      (b) Organic matter

(c) Iron      (d) Alkalies

**[RPSC-AE(Pre) : 2013]**

89. Dolomite bricks are

    (a) Acid refractory bricks

    (b) Basic refractory bricks

    (c) Neutral refractory bricks

    (d) Ordinary bricks

    **[RPSC(Vice Principal/Suptdt.)-2018]**

90. The required minimum compressive strength of building bricks as recommended by IS 1077 - 1957 and 1970 is :

    (a) 140 kg/cm²          (b) 105 kg/cm²

    (c) 70 kg/cm²           (d) 35 kg/cm²

    **[MPSC-2018]**

91. Excess of silica in the clay-

    (a) Makes the brick brittle & weak

    (b) Changes the colour of brick from red to yellow

    (c) Improves impermeability and durability

    (d) Makes the brick crack and wrap on of the brick drying

92. Hydraulic lime is obtained by-

    (a) Fly ash

    (b) Burning of kankar

    (c) Red stone

    (d) Calcination of pure clay

93. The portion of a brick obtained by cutting a brick lengthwise into two portions is known as:

    (a) Queen closer       (b) Mitred closer

    (c) Bevelled closer    (d) King closer

94. Match the correct code for constituents of brick by using **List-I** with **List-II**.

    **List - I**

    A. Silica

    B. Lime

    C. Alumina

    D. Oxide of iron

    **List- II**

    1. 50-60%

    2. 20-30%

    3. Upto 5%

    4. upto 5% or 6%

    (a) A-1 B-2 C-4 D-3

    (b) A-1 B-3 C-2 D-4

    (c) A-1 B-2 C-3 D-4

    (d) A-2 B-1 C-4 D-3

95. Which Class of Bricks are used for centering of R.C.C. structures?

    (a) IV Class          (b) II Class

    (c) I Class           (d) III Class

96. The standard brick weight should range from:

    (a) 2000 kg/m³ to 3000 kg/m³

    (b) 1600 kg/m³ to 1920 kg/m³

    (c) 1350 kg/m³ to 1480 kg/m³

    (d) 1120 kg/m³ to 1300 kg/m³

97. Which of the following is not one of the four distinct operations involved in bricks manufacturing?

    (a) Drying

    (b) Preparation of clay

    (c) Burning

    (d) Water curing

98. Choose the correct advantages of clamp burning in brick manufacturing process?

    (a) Quality of bricks is uniform

    (b) It is possible to regulate fire in a clamp

    (c) It is a quick process

    (d) There is considerable saving of fuel

99. Which of these is a/an incorrect test for bricks to find out its suitability for the construction work?

    (a) Shape and size

    (b) Structure

    (c) Absorption

    (d) Heat conductivity

100. Figure out the correct dis-advantages of intermittent down-draught kilns?

    (a) Supply of bricks is not continuous

    (b) Bricks are not burnt evenly

    (c) Performance is not good than that of up-draught kiln

    (d) There is no close control of heat

101. The compressive strength (in N/mm²) of perforated bricks should not be less then

    (a) 3.5          (b) 5

    (c) 7            (d) 10

102. Chromite bricks are a type of

    (a) Modular bricks

    (b) Neutral fire bricks

    (c) Acidic fire bricks

    (d) Basic fire bricks

103. Which of the following are correct steps in the making of brick earth ?

    a. Digging              b. Weathering

    c. Tempering            d. Blending

    e. Unsoiling

    (a) e, a, c, b, d        (b) e, a, b, d, c

    (c) a, e, b, d, c        (d) e, a, d, b, c

104. Which one of the following brick is suitable for the high-class brick masonry ?

    (a) Bull nose bricks  (b) Jhumb bricks

    (c) Modular bricks    (d) Under burnt bricks

                                        **[NCL : 2020]**

105. Which of the following features regarding Double Flemish bond is not true?

    (a) Every course consists of headers and stretchers placed alternately

    (b) The facing and backing of the wall, in each course, have the same appearance

    (c) Quion closers are not required

    (d) Headers of any course are supported centrally by the stretchers of their underlying course

                                        **[GPSC-2019]**

106. Minimum thickness of wall where Single Flemish bond can be used is

    (a) Half brick thick

    (b) One brick thick

    (c) One and a half brick thick

    (d) Two brick thick

                                        **[GPSC-2019]**

107. The maximum slenderness ratio for a load bearing is

    (a) 13          (b) 20

    (c) 27          (d) 37

                                        **[GPSC-2019]**

108. A small quantity of magnesia in brick earth will _____.

    (a) Decrease shrinkage

    (b) Cause flaking of the bricks

    (c) Imparts red colour to the bricks

    (d) Imparts plasticity

109. What is the percentage of alumina present in the good brick earth?

    (a) 10 percent        (b) 50 to 60 percent

    (c) < 1 percent       (d) 20 to 30 percent

110. When the deposit of efflorescence is more than 10% but less than 50% of the exposed area of the brick, the presence of efflorescence is classified as:

    (a) heavy            (b) slight

    (c) nil              (d) moderate

111. The nominal thickness of traditional two brick wall as per IS 2212 :1991 is

    (a) 9 inches         (b) 13.5 inches

    (c) 14 inches        (d) 18 inches

112. Bricks molded with a double bull nose on the end are called

    (a) Curved sector bricks

    (b) Bull nose bricks

    (c) Cow nose bricks

    (d) Channel bricks

113. Choose the reason why pebbles of any kind is undesirable in brick earth?

    (a) Presence of excess pebbles causes brick to melt

    (b) Due to the presence of pebbles bricks are crystallized and disintegrated during burning

    (c) Brick containing pebbles will not break regularly as desired

    (d) Presence of pebbles assists in burning

114. Which of these imparts plasticity to earth in bricks so that it can be moulded?

    (a) Lime            (b) Magnesia

    (c) Silica          (d) Alumina

115. Which of the following Cannot be a correct comparison between clamp burning and kiln burning?

    (a) Cost of fuel is low in clamp burning while cost of fuel is more in kiln burning

    (b) Initial cost is low in clamp burning while initial cost is more in kiln burning

    (c) Skilled supervision is necessary throughout the process in clamp burning while such supervision is not necessary in kiln burning.

    (d) Percentage of good quality bricks is small in clamp burning while percentage of good quality bricks is more in kiln burning

116. For construction of two cubic meter of bricks masonry, the number of modular bricks required, is

    (a) 2000           (b) 550

    (c) 1000           (d) 500

117. Bull's trench kiln is used in the manufacturing of

    (a) Cement         (b) Lime

    (c) Bricks         (d) M-sand

118. According to standard specifications for First class brickwork, bricks shall have minimum crushing strength of

    (a) 35 kg per sq cm

    (b) 150 kg per sq cm

    (c) 65 kg per sq cm

    (d) 105 kg per sq cm

119. The indentation marks left on bricks during the process of moulding are known as:

    (a) projections     (b) fillets

    (c) frogs           (d) marks

120. As per IS:1077-1992, the standard modular size (L × W × H) of common building bricks shall be:

    (a) 200 mm × 90 mm × 40 mm

    (b) 190 mm × 90 mm × 90 mm

    (c) 200 mm × 100 mm × 90 mm

    (d) 190 mm × 100 mm × 40 mm

121. Refractory bricks are manufactured specially for the application to:

    (a) Resist high crushing load

    (b) Act as barrier or insulator against sound

    (c) Withstand penetration of water

    (d) Withstand high temperature

122. In which class of brick, the crushing strength should not be less than 7.0 N/mm²?

    (a) Fourth class brick

    (b) Third class brick

    (c) First class brick

    (d) Second class brick

123. As per IS: 3495 (part I), what is the loading rate used to find the compressive strength of bricks?

    (a) 45 N/m2 per minute

    (b) 32 N/m2 per minute

    (c) 14 N/m2 per minute

    (d) 24 N/m2 per minute

**124.** A brick when cut at one end by half header and half stretcher, it is known as _____.

(a) King Closer          (b) Bat Closer

(c) Queen Closer        (d) Beveled Closer

**125.** The defect which causes deformation of shape of brick by rain water falling on hot brick is called _____.

(a) Blisters             (b) Chuffs

(c) Spots               (d) Bloating

**126.** A king closure is a

(a) Full brick

(b) Three fourth brick

(c) Crosswise half brick

(d) Longitudinal half brick

**[JPSC AE]**

**127.** Efflorescence of bricks is due to

(a) Excessive burning of bricks

(b) High Silt content in brick clay

(c) High porosity of bricks

(d) Soluble salts present in parent clay

**[JPSC AE]**

**128.** 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)**

**A.** Alumina

**B.** Silica

**C.** Magnesia

**D.** Limestone

**List–II (Corresponding influence)**

1. Color bricks

2. Plasticity recovery for moulding

3. Reacts with silica during burning and causes particles to unite together and development of strength

4. Preserves the form of brick at high temperature and prevent shrinkage

Code :

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

**[JPSC AE]**

**129.** Total chambers are in Hoffman's kiln–

(a) 5                  (b) 10

(c) 12                 (d) 15

**[UKSSSC Draftman 2017]**

**130.** The piece of brick cut with its one corner equivalent to half the length and half the width of a full brick, is known as–

(a) Queen closer       (b) Bevelled closer

(c) King closer        (d) Half king closer

**[UKSSSC Draftman 2017]**

**131.** A full brick or stone which is laid with its length perpendicular to the face of the wall is called–

(a) King closer        (b) Header

(c) Stretcher          (d) Facing

**[UKSSSC Draftman 2017]**

**132.** If _____ constituent is in excess in brick earth it makes bricks brittle.

(a) Alumina            (b) Silica

(c) Lime               (d) Magnesia

**[MPSC-2020]**

**133.** Presence of iron oxide affects:

(a) The color of the brick

(b) The strength of the brick

(c) The water absorption of the brick

(d) The dimensions of the brick

**[UKPSC JE - 2017]**

**134.** A good brick should not absorb water by weight more than?

(a) 10%                (b) 20%

(c) 25%                (d) 30%

**[UKPSC JE - 2017]**

**135.** Consider the following statements in respect of Clamp-burnt and Kiln-burnt bricks:

1. Clamp-burnt bricks have low initial cost whereas Kiln-burnt bricks have initial cost.

2. Local fuel can be used for both Clamp-burnt and Kiln-burnt bricks

3. For Clamp–burnt bricks no skilled supervision is needed whereas for Kiln-burnt bricks skilled supervision is continuously needed

Which of the above statements asre correct?

(a) 1 and 2 only    (b) 2 and 3 only

(c) 1 and 3 only    (d) 1, 2 and 3

**[UPPSC AE]**

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

(a) 50 cm    (b) 40 cm

(c) 30 cm    (d) 20 cm

**[SJVN JE 2021]**

**137.** _____is the process in which plasticity is induced into brick earth in order to make it fit for nedt process. It is generally done in pug mill.

(a) Blending    (b) Weathering

(c) Tempering    (d) Digging

**[SJVN JE 2021]**

**138.** The density of bricks should be

(a) 1400–1500 kg/m³ (b) 1500–1700 kg/m³

(c) 1700–1900 kg/m³ (d) 1900–2100 kg/m³

**[Punjab Draftman 2014]**

**139.** Hollow bricks are used for construction of

(a) Solid wall

(b) Light weight partition walls

(c) Foundations

(d) Should not be used at all

**[Punjab Draftman 2014]**

**140.** First class brick when immersed in water for 24 hours should not absorb water by weight more than

(a) 10%    (b) 15%

(c) 20%    (d) 25%

**[Punjab Draftman 2014]**

**141.** When brickwork is set with a fine joint, it is usual to fill the interior joints with thin liquid mortar then the process is called :

(a) Raking    (b) Rat trapping

(c) Larrying    (d) Grouting

**[Punjab Draftman 2014]**

**142.** Which of the following bonds is preferred to be used in 1/2 brick thick leaves of cavity walls ?

(a) Header bond

(b) Stretcher bond

(c) Single Flemish bond

(d) English bond

**[GPSC]**

**143.** Water absorption of a good brick should NOT exceed ____ of its dry weight we kept immersed in water for 24 hours

(a) 20 %    (b) 30%

(c) 25%    (d) 10%

**[DFCCIL 2018]**

**144.** The strength achieved by a brick depends on

(a) Composition of brick earth

(b) nature of moulding adopted

(c) burning and cooling process

(d) All the above

**[MPSC 2012]**

**145.** An indentation in the face of a bricks to form a key for holding the mortar is_____.

(a) Arris    (b) Bar

(c) Frog    (d) Quoin

**[UKPS JE 2015]**

**146.** The process of grinding clay with water and making it plastic is known as –

(a) Blending    (b) Pugging

(c) Tempering    (d) Weathering

**[Harbour Engg. (AE) - 2005]**

147. The brick which given a wedge like shape to be used in the construction of arches is called.

    (a) King closer          (b) Voussoir

    (c) Queen closer         (d) Cornice brick

    **[PWD-2006, TNPSC-2013, SSC-JE-2006]**

148. In the manufacturing of bricks,. pug mills are used for

    (a) Kneading             (b) Moulding

    (c) Drying               (d) Burning

    **[Kerala water authority -2006]**

149. The nominal thickness of one brick wall is

    (a) 90 mm                (b) 150 mm

    (c) 190 mm               (d) 200 mm

    **[PGCIL 2014]**

150. As per BIS the maximum limit of water absorption by weight for grade AA bricks is -

    (a) 10%                  (b) 15%

    (c) 20%                  (d) 25%

    **[V.H.S.E. - 2007, PGCIL-2006]**

151. The internal size of mould used in brick preparation is

    (a) Equal to the size of fully burned brick

    (b) Smaller than the size of fully burned brick

    (c) Greater than the size of fully burned brick

    (d) None of the above

    **[DRDO- 2007]**

152. Gypsum consists of–

    (a) $H_2S$ and $CO_2$

    (b) $CaSO_4$ and $H_2O$

    (c) Lime and $H_2O$

    (d) $CO_2$ and calcium oxide

    **[FCI JE 2016]**

153. The brick which is light in weight, reduce the transmission of heat, sound and dampness, is known as

    (a) Hollowbrick          (b) Cavity brick

    (c) Cellular bricks      (d) All of the above

    **[DSSB JE 2015]**

154 The following soil is good for making bricks

    (a) Weathered clay

    (b) Unexposed clay

    (c) Silted soil

    (d) Clay which is 1 metre below ground level

    **[DMRC JE 2015]**

155. Which of the following is the constituent of good brick earth whose excess cause the raw brick shrink and warp during drying and burning

    (a) Magnesia             (b) Iron oxide

    (c) Alumina              (d) Lime

    **[UPPCL JE 2015]**

156. The bricks used for a load bearing masonry building should possess the following crushing strength values

    (a) More than 3.5 $N/mm^2$

    (b) More than 10.5 $N/mm^2$

    (c) More than 2.5 MPa

    (d) More than 15 $kN/cm^2$

    **[MP Sub Engg. 2015]**

157. The water absorption capacity first class bricks should not be more than _____ of weight.

    (a) 30%                  (b) 25%

    (c) 16.6%                (d) 50%

    **[Uttrakhand JE Paper-I 2015]**

❑❑❑

## ANSWERS SHEET

1.  *Ans. (d)*

In the process of manufacturing bricks, the following four steps are involved:

1.  Preparation of clay
2.  Moulding
3.  Drying
4.  Burning

**1.  Preparation of clay :**

**(i)  Unsoiling :** In this process top layer of soil, about 200 mm in depth, is taken out and thrown away. The top soil is full of impurities and not use for purpose of preparing bricks.

**(ii)  Digging :** The clay is then dug out from the ground. It is spread on the levelled ground.

**(iii) Cleaning :** The clay, as obtained in the process of digging, should be cleaned of stones, pebbles, vegetable matter, etc.

   If these particles are in excess, the clay is to be washed and screened.

**(iv) Weathering :** The clay is then exposed to atmosphere for softening. The period of softening is from few week to few month.

**(v)  Blending :** The required ingredient to be added to it and mixing the clay.

•  Blending makes clay fit for next stage tempering.

**(vi) Tempering :** In the process of tempering, the clay is brought to a proper degree of hardness and it is made fit for the next operation of moulding.

   The water in required quantity is added to clay.

   For manufacturing good bricks on a large scale, the tempering is usually done in pug mill. Which may be operated mechanically or with the help of animal.

**2.  Moulding :**

The process of giving desire shape to the clay is term as moulding.

The moulding is done with the help of mould, which may be wood or steel.
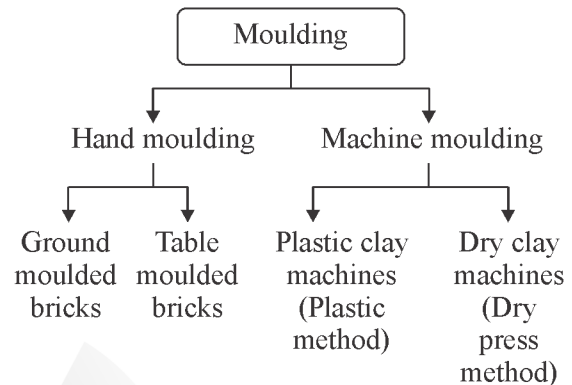


**3.  Drying :**

If bricks are directly burn without drying it lead to cracking and distortion.

**4.  Burning :**

Burning imparts hardness and strength to the bricks and makes them dense and durable.

The bricks are burn at 1100°C temperature so that the ingredient of brick can fuse with each other and can provide desire strength and density to the bricks.

The burning of the bricks is done either in clamp and kiln.

The burning of clay may be divided into three main stages.

**(i)  Dehydration (400 – 650°C)**

   This is also known as water smoking stage.

**(ii)  Oxidation Period (650 – 900°C)**

   At this stage chemical changes occurs in the constituents of bricks.

**(iii) Vitrification :**

   The temperature ranges 900 – 1100°C for low melting clay and 1000 – 1250°C for high melting clay.
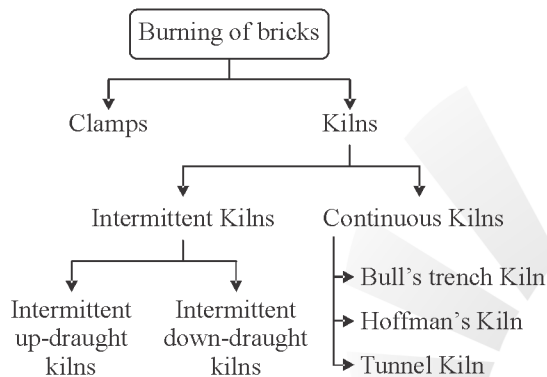
**2.** *Ans. (c)*

**3.** *Ans. (d)*

When bricks immersed in water for 24 hrs. it should not show absorption greater than 20% of its dry weight for first class brick and 22% for 2nd class bricks.

**4.** *Ans. (b)*

The Hoffman's kiln is constructed overground and hence it is sometimes known as the flame kiln. Its shape is circular in plan and it is divided into a number of chambers.

```
                    ┌──────────────────┐
                    │ Burning of bricks │
                    └──────────────────┘
                     ↓              ↓
                  Clamps          Kilns
                            ↓              ↓
                   Intermittent Kilns   Continuous Kilns
                                         → Bull's trench Kiln
                   ↓              ↓      → Hoffman's Kiln
            Intermittent    Intermittent → Tunnel Kiln
            up-draught      down-draught
            kilns           kilns
```

**5.** *Ans. (c)*

Fire clay bricks are made from fire clay and also known as refractory bricks.

These bricks are laid in fire clay mortar.

**6.** *Ans. (d)*

**Bullnose bricks :** A brick moulded with a rounded angle is known as a bullnose. These types of bricks are used for rounded quoin (round corner). An external corner of a wall is known as quoin.

Bullnose bricks commonly used in the rounded edge for staircase steps, building corners, verandahs etc.

**7.** *Ans. (c)*

**Bloating :** This defect observed as spongy swollen mass over the surface of burned bricks is caused due to the presence of excess carbonaceous matter and sulphur in brick clay.

**Cracks :** This defect may be because of lumps of lime or excess of water. When bricks come in contact with water, the absorbed water reacts with lime nodules causing expansion and a consequent disintegration of bricks.

**Chuffs :** The deformation of the shape of bricks caused by the rain water falling on hot bricks is known as chuffs.

**Laminations :** These are caused by the entrapped air in the voids of clay. Laminations produce thin lamina on the brick faces which weather out on exposure.

**Black Core :** When brick-clay contains bituminous matter or carbon and they are not completely removed by oxidation, the brick results in black core mainly because of improper burning.

**Efflorescence :** This defect is caused because of alkalis present in bricks. When bricks come in contact with moisture, water is absorbed by them.

This absorbed water dries out by evaporation from the exposed faces and the soluble salts it contains crystallize out on the surface.

On drying grey or white powder patches appear on the brick surface.

• Efflorescence can be minimized by selecting proper clay materials for brick manufacturing, preventing moisture to come in contact with the masonry. This can be achieved by providing waterproof coping and by using water repellent materials in mortars and by providing damp proof course.

**8.** *Ans. (d)*

Hollow bricks are also known as the cellular or cavity bricks.

They are light in weight about one-third the weight of the ordinary brick of the same size.

Hollow bricks reduce the transmission of heat, sound and damp.
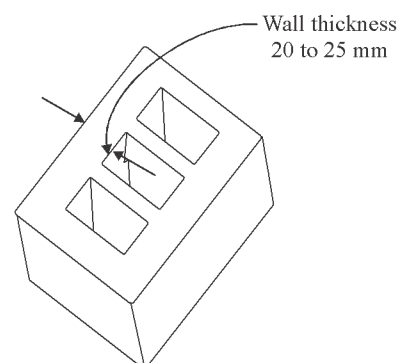


**Hollow brick**

**9.** *Ans. (d)*

| Class Designation | Average Compressive Strength not less than | |
| --- | --- | --- |
| | N/mm$^2$ | Kg/cm$^2$ |
| 35 | 35.0 | 350 |
| 30 | 30.0 | 300 |
| 25 | 25.0 | 250 |
| 20 | 20.0 | 200 |
| 17.5 | 17.5 | 175 |
| 15 | 15.0 | 150 |
| 12.5 | 12.5 | 125 |
| 10 | 10.0 | 100 |
| 7.5 | 7.5 | 75 |
| 5 | 5.0 | 50 |
| 3.5 | 3.5 | 35 |

**10.** *Ans. (b)*

**11.** *Ans. (b)*

**12.** *Ans. (c)*

**13.** *Ans. (a)*

The size of frog should be 10 cm × 4 cm × 1 cm.

The main purpose of providing frog is to form a key for holding the mortar and therefore, the bricks are laid with frogs on top.

It is also use to indicate the trade name of manufacturer's.

**14.** *Ans. (d)*

**15.** *Ans. (b)*

1. Unsoiling
2. Digging
3. Weathering
4. Blending
5. Tempering

**16.** *Ans. (d)*

**17.** *Ans. (d)*

**18.** *Ans. (b)*

| Type of bricks | | Compressive Strength (N/mm²) |
| --- | --- | --- |
| First class bricks | - | 10.5 |
| Second class bricks | - | 7.0 |
| Common building bricks | - | 3.5 |

**19.** *Ans. (c)*

The depression provided in the face of a brick during its manufacturing is called frog in bricks.

**20.** *Ans. (b)*

Size of standard brick should be 19 × 9 × 9 cm.

Size of standard brick with mortar 20 × 10 × 10 cm.

Volume of one brick ⇒ 20 × 10 × 10 = 2000 cm$^3$

$$= 2000 \times 10^{-6} \, m^3$$

Number of bricks required in one cubic meter

$$\Rightarrow \frac{\text{Total Volume}}{\text{Volume of one brick}} = \frac{1}{2000 \times 10^{-6}}$$

$$\Rightarrow \frac{1000000}{2000} = 500 \text{ bricks}$$

⇒ Weight of 1 m$^3$ bricks approximately = 1800 kg.

**21.** *Ans. (a)*

**According to IS : 3495 – Part (3)**

The liability to efflorescence shall be reported as nil, slight, moderate, heavy and serious.

- **Nil :** When the deposit of efflorescence is imperceptible.

- **Slight :** When not more than 10 percent of the exposed area of the brick is covered with a thin deposit of salts.

- **Moderate :** When the deposit of efflorescence is more than 10 percent but less than 50% of the exposed area of the brick but unaccompanied by powdering of flaking of the surface.

- **Heavy :** When the deposit of efflorescence is more than 50% but the deposits do not powder of flake away the brick surface.

- **Serious :** When there is a heavy deposit of salts accompained by powdering and/or flaking of the exposed surfaces.

**22.** *Ans. (b)*

Under burnt bricks : These are half burnt bricks. The color is yellow. The strength is low. Such bricks should not be exposed to rain water. These are used as soiling under RCC footing or basement. These are also used as surkhi in lime terracing.

**Jhumb bricks :** Jhumb bricks are mostly not used because these are over burnt bricks with irregular shape and size. Jhumb bricks twisted due to over burning.

**Modular bricks :** Modular bricks of standard size 190 mm × 90 mm × 90 mm are used for high class brick masonry.

**23.** *Ans. (d)*

A good brick earth should contain about 50% to 60% of silica. The excess of silica destroys the cohesion between particles and brick become brittle and weak.

**24.** *Ans. (b)*

If Alumina is present in excess, the raw bricks shrink and warp during drying and burning and become too hard when burnt.

- The excess of silica destroys the cohesion between particles and bricks become brittle.

- The excess of lime causes the brick to melt and hence its shape is lost.

- The excess oxide of iron makes the bricks dark blue or blackish.

- Excess of magnesia leads to the decay of bricks.

**25.** *Ans. (c)*

**For first class bricks :**

- These should have uniform texture.

- No impression should be left on the brick when a scratch is made by a finger nail.

- These should be free from flaws, cracks and stones.

- A metallic or ringing sound should come when two bricks are struck against each other.

- The surface should be smooth and rectangular, with parallel, sharp and straight edges and square corners.

- The crushing strength of the brick should not be less than 10 N/mm².

- Water absorption should not be greater than 20% of its dry weight.

**26.** *Ans. (c)*

**27.** *Ans. (c)*

**28.** *Ans. (c)*

**29.** *Ans. (d)*

**30.** *Ans. (d)*

**31.** *Ans. (c)*

- Standard size of modular brick as per Indian standard is 19 × 9 × 9 cm or 190 mm × 90 mm × 90 mm.

- Nominal size of modular brick is 20 × 10 × 10 cm (size with mortar) or 200 mm × 100 mm × 100 mm.

**32.** *Ans. (c)*

Silica = 50 – 60%,

Lime = 4 – 5 %

Alumina = 20 – 30% ,

Iron oxide = 5 – 6%

Magnesia = 1%

**33.** *Ans. (d)*

**34.** *Ans. (d)*

**35.** *Ans. (a)*

**36.** *Ans. (c)*

The bricks with crushing strength of 7 to 14 N/mm$^2$ are graded A and those having above 14 N/mm$^2$ are graded as AA.

**37.** *Ans. (a)*

**38.** *Ans. (c)*

**39.** *Ans. (a)*

**40.** *Ans. (a)*

**41.** *Ans. (a)*

**Underburning :**

When bricks are not burnt to cause complete vitrification, the clay is not softened because of insufficient heat and the pores are not closed.

Consequently, bricks with low compressive strength and high-water absorption will be produced.

They produce adult sound when struk against each other.

**Overburning :**

When bricks over-burn, soft molten mass is produced and the brick will its shape along with other designated requirements.

**42.** *Ans. (c)*

**43.** *Ans. (d)*

**44.** *Ans. (a)*

**45.** *Ans. (a)*

**46.** *Ans. (d)*

**47.** *Ans. (b)*

**48.** *Ans. (a)*

The percentage of various ingredients for good quality brick earth are as follows:

| Silica | — | 50 - 60% |
|---|---|---|
| Alumina | — | 20 - 30% |
| Lime | — | 5 - 10% |
| Oxide of iron | — | 5 - 6% |
| Magnesia | — | <1% |

Carbon dioxide ⎫
Sulphur trioxide ⎬ Very small percentage
Water ⎭

**49.** *Ans. (d)*

Length of brick = 2 × width of brick + thickness of mortar.

Height of brick = Width of brick

**50.** *Ans. (b)*

**51.** *Ans. (d)*

Bricks, tiles, earthenwares and stone wares are glazed by an impervious film to protect the surface from chemical attack and other weathering agencies.

A glaze is a glassy coat of thickness about 0.1 to 0.2 mm applied on the surface of an item and then fused into place by burning at high temperature.

Glazing make the articles durable and impervious.

Glazing provide smooth surface.

**52.** *Ans. (b)*

**Types of fire bricks**

1.  Acidic Refractories

    (a)  Ordinary fire bricks

    (b)  Silica bricks

    (c)  Ganister bricks

2. Basic Refractories

    (a)    Magnesite bricks

    (b)    Dolomite bricks

    (c)    Bauxite bricks

3. Neutral Refractories

    (a)    Chromite bricks

    (b)    Carborundum

    (c)    Chrome Magnesite bricks

    (d)    Spinal Bricks

    (e)    Forsterite - Bricks

**53.** *Ans. (a)*

Fire-clay bricks are made from fire-clay and are also known as refractory bricks.

The fire bricks can resist high-temperature without softening or melting. Hence, they are used for linings of interior surfaces of furnaces, chimneys, kilns, ovens, fire places etc.

- The colour of these bricks whitish yellow or light brown.

- The minimum average compressive strength of these bricks should be 3.5 N/mm².

- The water absorption of refractory bricks varies from 4 – 10%.

Following are the types of refractory bricks :

1. Acidic bricks

2. Basic bricks

3. Neutral bricks

**54.** *Ans. (c)*

**55.** *Ans. (c)*

**56.** *Ans. (b)*

**Physical properties of bricks**

- Shape

- Size

- Color

- Texture

**Mechanical properties of bricks**

- Compressive strength

- Flexure strength

- Fire resistance

- Durability

**57.** *Ans. (b)*

**58.** *Ans. (c)*

**59.** *Ans. (c)*

**60.** *Ans. (c)*

**Iron Oxide :** Imparts red colour to the bricks.

**Magnesia :** A small quantity of magnesia in brick earth imparts yellow tint to the bricks and decreases shrinkage.

**Silica :** The presence of this constituent prevents, cracking, shrinkage and warping. The durability of bricks depends on the proper proportion of silica in earth brick.

**Lime :** Lime also prevent the shrinkage of raw bricks.

**Alumina :** Alumina imparts plasticity to the brick earth, so that it can be moulded easily.

**61.** *Ans. (c)*

**62.** *Ans. (a)*

**63.** *Ans. (b)*

**64.** *Ans. (a)*

**65.** *Ans. (a)*

66. *Ans. (d)*

67. *Ans. (c)*

68. *Ans. (c)*

69. *Ans. (c)*

70. *Ans. (a)*

71. *Ans. (b)*

| IS : 3102 | ⇒ | Classification of burnt clay solid bricks. |
| IS : 3495 | ⇒ | Method for test for burnt clay building bricks. |
| IS : 3495 - Part-1 | ⇒ | Determination of compressive strength. |
| IS : 3495 - Part-2 | ⇒ | Determination of water absorption. |
| IS : 3495 - Part-3 | ⇒ | Determination of efflorescence. |
| IS : 3495 - Part-4 | ⇒ | Determination of warpage. |
| IS : 3496 | ⇒ | Methods of test for burnt, clay building tiles. |

72. *Ans. (c)*

73. *Ans. (d)*

Flyash is residue generated from thermal power plants.

74. *Ans. (d)*

75. *Ans. (c)*

76. *Ans. (c)*

**Bed :** It is a term used to indicate the lower surface of brick in each course.

**Bond :** It is a term applied to the over lapping of bricks in a wall in alternate courses, to bind the whole wall together. Bonding is essential to eliminate continuous vertical joints.

**Arises :** The edges of the bricks are called as arises. Arises should be sharp and unbroken.

**Bed joint :** Joints parallel to the bed of bricks or stone in a course are termed on bed joints.

**Perpends :** It is a vertical joint on the face of a wall directly over vertical joints of alternate courses.

**Frog :** Depressions provided in the face of the brick is called as frog. It forms a key with mortar to prevent sliding.

**Lap :** The horizontal distance between two vertical joints is termed as lap.
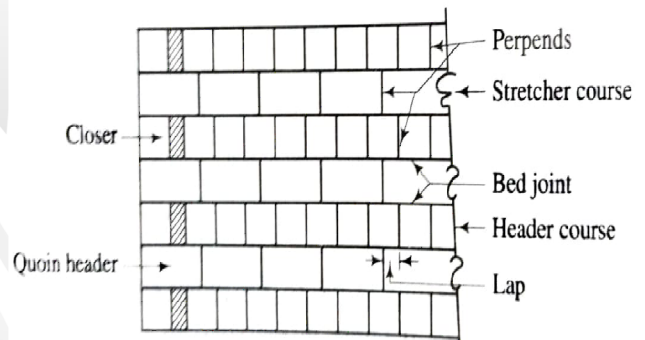


77. *Ans. (c)*

**Closer :** It is a portion of brick cut in such a manner that its one long face remains uncut.

1. **King closer :** It is a brick which is cut in such a way that the width of one of its end is half of that of a full brick.

2. **Queen closer :** It is a term applied to a brick which is half as a full brick. Queen closer is made by cutting a brick lengthwise into two portions.
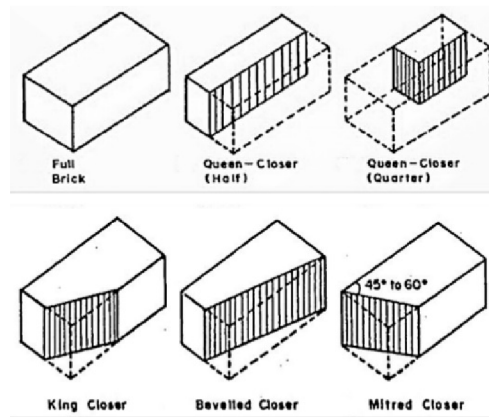
**78.**   *Ans. (a)*

**79.**   *Ans. (d)*

**Header :** It is a full brick which is laid with its length perpendicular to the face of the wall. A course of brickwork entirely composed of headers in header course.

**80.**   *Ans. (d)*

**81.**   *Ans. (c)*

**82.**   *Ans. (d)*

**83.**   *Ans. (d)*

**84.**   *Ans. (b)*

**85.**   *Ans. (a)*

**86.**   *Ans. (a)*

**87.**   *Ans. (b)*

**88.**   *Ans. (d)*

**89.**   *Ans. (b)*

**90.**   *Ans. (d)*

Min. Compressive strength of building bricks is 3.5 N/mm$^2$.

First class $\geq$ 10.5 N/mm$^2$

Second class $\geq$ 7 N/mm$^2$

Third class $\geq$ 3.5 N/mm$^2$

Fourth class $\geq$ 40 N/mm$^2$

Over burnt brick used in foundation related work.

**91.**   *Ans. (a)*

- Excess of silica makes the bricks brittle and weak.

- Good brick earth should certain 50-60% of silica

- It prevents cracking shrinking & wrapping of Raw bricks.

- Silica impart in uniform shape of bricks

**92.**   *Ans. (b)*

- The lime which is obtained by the calcination of comparatively pure limestone is known as quick lime or caustic lime.

- It's chemical composition is (CaO) oxide of calcium & it has a great affinely far moisture.

- After treating quick lime with water we get hydrated lime.

- Lime produced form a pure variety of chalk is fat lime.

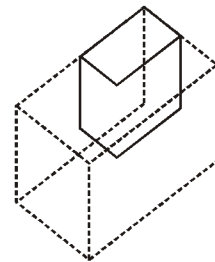**Lime Cycle :**
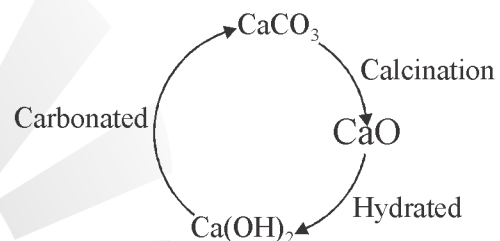


**93.**   *Ans. (a)*

**Concept:**

**Queen closer:**

- **It is the portion of brick obtained by cutting a brick lengthwise into two portions.**

- **Thus, a queen closer is a brick that is half as wide as the full brick.**

- This is also known as the queen's closer half. When a queen closer is broken into two pieces, it is known as queen closer quarter.
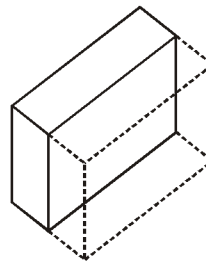


Queen-Closer        Queen-Closer
(Holf)              (Quarter)

**94.** *Ans. (b)*

**95.** *Ans. (b)*

Uses : First class bricks are recommended for pointing, exposed face work in masonry structures, flooring and reinforced brickwork.

Uses : Second class bricks are recommended for all important or unimportant hidden masonry works and centering of reinforced brick and reinforced cement concrete (RCC) structures.

**96.** *Ans. (b)*

**97.** *Ans. (d)*

**98.** *Ans. (d)*

**99.** *Ans. (d)*

**Following tests are conducted on bricks to determine their quality for construction,**

1.  Absorption **test.**

2.  Crushing strength **test.**

3.  Hardness **test.**

4.  Shape and size.

5.  Color **test.**

6.  Soundness **test.**

7.  Structure of **brick.**

8.  Presence of soluble salts (Efflorescence **Test)**

**100.** *Ans. (a)*

**Intermittent Kilns** are also the periodic kind of kilns, because in such kilns only one process can take place at one time. Various major processes which takes place in the kilns are:

*Loading, unloading, Cooling, and Burning of bricks.*

There are two kind of intermittent kilns:

(i) Up-draught Intermittent Kilns

(ii) Down draught Intermittent Kilns

Down draught kilns are more efficient, because the heat is utilized more by moving the hot gases in the larger area of the kiln. In up draught kilns the hot gases are released after they rise up to chimney entrance.

**101.** *Ans. (c)*

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

**102.** *Ans. (b)*

**Neutral Refractory Bricks**

Chromite bricks: 50% chrome, 30% Iron oxide, 20% Bauxite. Chrome magnesite bricks: A mixture of chrome ore and magnesite ore with a min % of Chromium (III) Oxide is >18% & Magnesium Oxide is >30%.

**103.** *Ans. (b)*

The manufacturing process of bricks involves four distinct operations:

**Preparation of clay can be carried out in the following operations:**

| Unsoiling | Removal of top 200 mm of soil. |
|---|---|
| **Digging** | The remaining soil is dug out and spread over the level field. |
| **Cleaning** | Removal of pebbles, stones, organic and vegetative matter |
| **Weathering** | Clean soil is exposed to the atmosphere for a few weeks to few months for softening, mellowing, and ripening. |
| **Blending** | To add any ingredient to the clay, it is to be added in this stage by making the clay loose and spread the ingredient over it. |
| **Tempering** | Water is added to the clay in order **to bring it up to the required plasticity.** It is carried out in **Pub Mill.** |

**Moulding:**

It is a process of **giving the required shape and size** to the brick either manually or mechanically.

**Drying:**

It is a process to **reduce the moisture content** of bricks up to 2% by drying either naturally or artificially before burning.

**Burning:**

It is a process of **burning bricks in clamps or kilns** to impart strength and hardness and make it durable and dense.

**104.** *Ans. (c)*

**105.** *Ans. (d)*

**106.** *Ans. (c)*

**107.** *Ans. (c)*

**108.** *Ans. (d)*

**Concept :**

**Refractory bricks :**

• Refractory bricks are made from fire clay, using the same process as ordinary clay.

• They are yellowish or light brown coloured brick.

• It is made up of materials that have high melting points and have properties that make them **suitable to act as heat resisting barriers between high and low-temperature zones.**

• Water absorption varies from 4-10% and the compressive strength lies between 15-20 N/mm$^2$

• It is **generally used for lining blast furnaces, Ovens, Kiln, Boilers, and Chimneys.**

**109.** *Ans. (d)*

**110.** *Ans. (c)*

**111.** *Ans. (a)*

**112.** *Ans. (c)*

**113.** *Ans. (b)*

**114.** *Ans. (d)*

**115.** *Ans. (c)*

**116.** *Ans. (c)*

**117.** *Ans. (c)*

**118.** *Ans. (a)*

**119.** *Ans. (c)*

**120.** *Ans. (b)*

**121.** *Ans. (d)*

**122.** *Ans. (d)*

**123.** *Ans. (c)*

**124.** *Ans. (a)*

**125.** *Ans. (b)*

**126.** *Ans. (b)*

King closer is made when the width of one end of the brick becomes half the width of another brick and the other end of the brick remains equal to the end of another brick.

Hence one can say that king closer is the best mechanism in which a brick can be cut in a cross wise way and the picture of the half brick in a cross sectional way can be obtained.

**127.** *Ans. (a)*

**128** *Ans. (c)*

**129.** *Ans. (c)*

**130.** *Ans. (c)*

King Closer : If a brick is cut in such a way that the width of one end becomes half that of a full brick, while the width at the other end is equal to the full width, then it is called as king closer.

**131** *Ans. (b)*

**132.** *Ans. (b)*

**133.** *Ans. (a)*

**Oxides of Iron :** A small quantity of oxide of iron to the extent of about 5 to 6 percent is desirable in good brick earth. It helps as lime to fuse sand. **It also imparts red colour to bricks.** The excess of oxide of iron makes the brick dark blue or blackish. If, on the other hand, the quantity of iron oxide is comparatively less. the bricks will be yellowish in colour.

**134.** *Ans. (b)*

After immersion in cold water for 24 hours, water absorption shall not be more than **20 percent by dry weight,** for a good quality brick.

**135.** *Ans. (d)*

**136.** *Ans. (a)*

**137.** *Ans. (c)*

Tempering - **Tempering** is the process in which plasticity is induced into brick earth in order to make it fit for next process.

It is generally done in pug mill.

**138.** *Ans. (b)*

Value of bulk density for bricks that was made with clay is **1500 kg/m3 to 2000kg/m³**

**139.** *Ans. (b)*

Hollow Bricks are used in **partition walls, boundary fences, huge structures,** etc. It is also likely to be used in areas prone to pollution for construction, in the masonry walls to be reinforced, and to reduce the use of mortar

**140.** *Ans. (c)*

**Water absorption should be 20% of its dry weight** when immersed in cold water for 24 hours. The crushing strength of the brick should not be less than 10 N/mm²

**141.** *Ans. (d)*

When brickwork is set with a fine joint, it is usual to fill the interior joints with a thin liquid mortar. This process is called grouting

**142.** *Ans. (d)*

**143.** *Ans. (a)*

| Water absorption test | After immersion in cold water for 24 hours, **water absorption shall not be more than 20 percent by dry weight,** for a good quality brick |
|---|---|

**Important point :** Water absorption (per cent by mass) of brick after 24 hr immersion in cold water is given by

$$= \frac{(M_2 - M_1)}{M_1} \times 100$$

Where,

$M_1$ = Weight of oven-dried brick.

$M_2$ = Weight of brick after immersing in water for 24 hrs.

**144.** *Ans. (d)*

The strength of bricks depends on **the soil used to make the bricks, method and making process, burning of bricks.** Since the nature of the soil varies from region to region, the average strength of bricks also varies from region to region. 3. Size and shape of the masonry construction.

**145.** *Ans. (c)*

**Frog** is an indentation of depression on the top face of a brick made with the object of forming a key for the mortars. This reduces the weight of the brick also.

It is kept on the **top face** while constructing a wall so that mortar is filled properly in it.

Size of frog = 100mm × 40mm × 10mm

Depth of frog = 10mm to 20 mm

**Purpose of frog :** It will provide a key for holding mortar in brick masonry

It can be used for branding purpose

**146.** *Ans. (b)*

**Blending :** Process in which different ingredients of brick-earth are sprayed over the weathered clay in required proportions.

**Wheathering :** In which cleaned clay is exposed to the atmosphere for few weeks to few months.

**Pugging :** Process of grinding clay with water so it enhance plasticity generally carried out in pug mill.

**Tempering :** Mixed ingredients is tempered by being thoroughly broken up of brick earth.

**147.** *Ans. (a)*



**Queen closer (half cut)**          **(King closer side cut)**
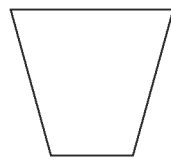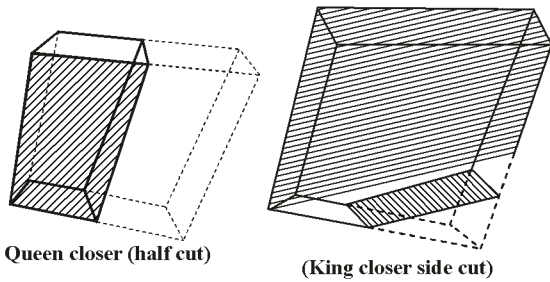


(Voussoir)

One side width more than other.

**148.** *Ans. (a)*

**149.** *Ans. (a)*

**150.** *Ans. (c)*

**151.** *Ans. (c)*

The internal size of mould is kept greater than the size of fully burned brick desirable to allow shrinkage during drying and burning.

**152.** *Ans. (b)*

**153.** *Ans. (d)*

**154.** *Ans. (a)*

**155.** *Ans. (c)*

**156.** *Ans. (b)*

**157.** *Ans. (c)*

❑❑❑

# UNIT-III

## PERT & CPM

# PERT & CPM

**CHAPTER 1**

## OBJECTIVE QUESTIONS

1. Resource smoothening means

   (a) Gradual increase in resources

   (b) Optimisation and economial utilization of resources

   (c) Complete distribution of resources

   (d) None of the above

2. Cost slope of the direct cost curve is given by

   (a) $\dfrac{\text{Crash cost} - \text{Normal cost}}{\text{Crash time}}$

   (b) $\dfrac{\text{Normal cost} - \text{Crash cost}}{\text{Normal time}}$

   (c) $\dfrac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{Crash time}}$

   (d) $\dfrac{\text{Normal cost} - \text{Crash cost}}{\text{Crash time}}$

3. Slack $(T_L - T_E)$ is given as the difference between

   (a) Earliest expected time and latest allowable time

   (b) Final event time and initial event time

   (c) Latest allowable time and earliest expected time

   (d) Final event time and initial event time.

4. Budgeting with Bar chart helps in the determination of

   (a) Total cost of a project

   (b) Direct cost of a project

   (c) Indirect cost of a project

   (d) Total time along with the cost of a project

   **[KPSC-AE]**

5. Expected time of an activity is calculated in PERT using the formula

   (a) $\dfrac{4a + 4m + 4b}{6}$

   (b) $\dfrac{a + m + b}{6}$

   (c) $\dfrac{a + 4m + b}{6}$

   (d) $\dfrac{a + 6m + b}{4}$

6. In a time scaled version of network critical activites are shown along

   (a) An inclined path

   (b) An oblique path

   (c) A veritcal straight path

   (d) A horizontal straight path

7. In PERT, the variance of an activity is determined by

   (a) $\dfrac{b - a}{6}$

   (b) $\dfrac{(b - a)^2}{6}$

   (c) $\left(\dfrac{b - a}{6}\right)^2$

   (d) $\dfrac{b^2 - a^2}{6}$

8. What is the time by which completion of an activity can be delayed without affecting the start of succeeding activities ?

   (a) Total float

   (b) Inteferring float

   (c) Free float

   (d) Independent float

9. Activity 'C' follows activity 'A' and activity 'D' follows activities 'A' and 'B'. The correct network of the projects is

(a)



(b)



(c)



(d)
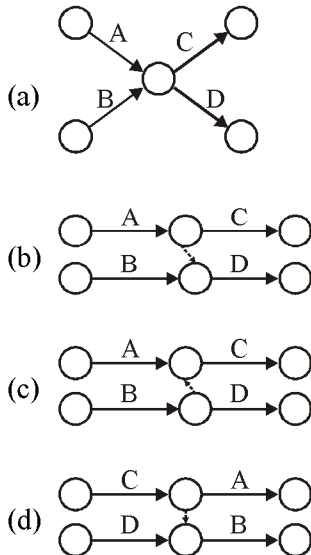


10. In the process of determining the quality of large group, reliability is expressed as

(a) Reliability Number

$$= 1 - \left[ \frac{\text{No. of defective units}}{\text{No. of units tested}} \times 100 \right]$$

(b) Reliability Number

$$= 1 - \left[ \frac{\text{No. of units tested}}{\text{No. of defective units}} \times 100 \right]$$

(c) Reliability Number

$$= 100 - \left[ \frac{\text{No. of defective units}}{\text{No. of units tested}} \times 100 \right]$$

(d) Reliability Number

$$= 100 - \left[ \frac{\text{No. of units tested}}{\text{No. of defective units}} \times 100 \right]$$

11. Lead time in material management means

(a) Elapsed time

(b) Time delay factor

(c) Both (a) and (b)

(d) Time elapsed between ordering, receiving and putting material into use

12. The optimistic, most likely and pessimistic time estimates of an activity are 8, 10, 12 days respectively. What is the expected time?

(a) 9 days        (b) 10 days

(c) 11 days       (d) 12 days

13. The number of errors in the given network is
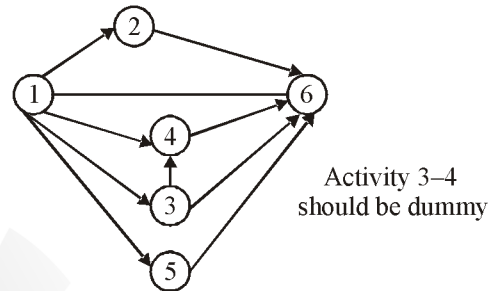


Acitivity (3) – (4) should be dummy.

(a) 1        (b) 2

(c) 3        (d) 4

14. Bar chart is drawn for

(a) Time Vs resources

(b) Time Vs progress

(c) Time Vs activity

(d) Activity Vs resources

15. The rule of numbering the events is introduced by

(a) D.R. Fulkerson    (b) F.W. Taylor

(c) Henry Gantt       (d) M.R. Kelly

16. In Bar chart method, the activity is indicated along

(a) The ordinate     (b) The abscissa

(c) X-axis           (d) None of these

**[Haryana JE-2018]**

17. A dummy activity

(a) Required resources

(b) Represented by straight bold line

(c) Does not require any time

(d) All of these

**[Haryana JE-2018]**

18. The critical activity has

(a) Maximum float   (b) Minimum float

(c) Zero float      (d) Variable float

**[ISRO-2015, 2017]**

19. Whenever an activity has zero total float, then

(a) Free float of the activity must be zero but independent float need not be zero

(b) Independent float must be zero but free float need not be zero

(c) free float and independent float both must be zero

(d) Free float and independent float both need not be zero

**[Chandigarh JE - 2016]**

20. Time and progress chart are also known as

(a) Bar chart

(b) Modified milestone chart

(c) Critical path method chart

(d) All of these

**[Chandigarh JE - 2016]**

21. Each circle represents

(a) A network      (b) An event

(c) An activity    (d) Critical path

**[Haryana JE–2018]**

22. The activity with minimum _____ should be crashed first.

(a) Cost slope     (b) Normal cost

(c) Crash cost     (d) Normal time

**[Haryana JE-2018]**

23. PERT is an

(a) Activity-oriented technique

(b) Event-oriented technique

(c) Network-oriented technique

(d) All of these

**[Haryana JE-2018]**

24. An activity in a project management network is

(a) The beginning or end of a specified job

(b) An element of work entailed in the project

(c) Represented by a circle in a netwrok with a number in it

(d) The progress of work up to a certain limit

**[ISRO-2017]**

25. CPM stands for

(a) Construction Project Management

(b) Critical Path Method

(c) Construction Path Method

(d) Critical Project Management

**[Haryana JE-2017]**

26. One of the main disadvantages of the bar chart for construction management is

(a) The time schedule is not shown properly

(b) Progress of the work cannot be monitored

(c) The financial aspect is not shown

(d) Does not show the interdependencies of the activity

**[RPSC ACF - 2011]**

27. Critical path method (CPM) network is

(a) Activity oriented

(b) Event oriented

(c) Both activity as well as event oriented

(d) None of these

**[RPSC ACF - 2011]**

28. Which of the following is not a PERT event?

(a) Site investigation starter

(b) Sessional work completed

(c) Bus starts from Jaipur

(d) Class is being attended

**[HPSC - 2014]**

29. A dummy activity in project network does not consume :

(a) Time            (b) Material

(c) Money           (d) All of above

**[HPSC - 2014]**

**30.** In a CPM network the activity in non critical if-

(a) EST = LST & EFT=LFT

(b) EST < LST & EFT< LFT

(c) EST > LST & EFT > LFT

(d) EST < LST & EFT > LFT

**[HPSC - 2014]**

**31.** In construction planning, an unreal activity which indicates that an activity following it, cannot be started unless the preceding activity is complete is known as :

(a) Free float        (b) Total float

(c) Dummy           (d) Event

**[HPSC - 2014]**

**32.** The interfering float of an activity is the difference between :

(a) Total float and free float

(b) Total float and independent float

(c) Free float and independent float

(d) None of the other options

**[HPSC - 2014]**

**33.** A critical path has :

(a) Zero slack        (b) Minimum slack

(c) Maximum slack  (d) Infinite slack

**[HPSC - 2014]**

**34.** The time by which a particular activity can be delayed without affecting the preceding and succeding activity is called as :

(a) Total float        (b) Free float

(c) Slack             (d) Independent float

**[HPSC - 2014]**

**35.** If for an activity optimistic time is 1 day, pessimistic time is 8 days and most likely times is 3 days, the expected time is

(a) 2 days           (b) 3.5 days

(c) 4 days           (d) 4.5 days

**[HPSC - 2014]**

**36.** The conception of idea for any construction work is the responsibility of

(a) Owner            (b) Engineer

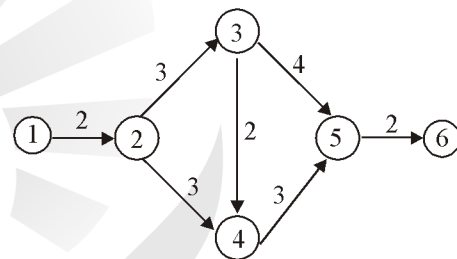(c) Contractor        (d) All of these

**[HPSC - 2014]**

**37.** When time to completion of a project is reduced, it usually results in :

(a) A decrease in resource deployment

(b) An increase in indirect cost

(c) A decrease in indirect cost

(d) A decrease in taxes

**[HPSC - 2014]**

**38.** In the network shown below, the critical path is:



(a) 1–2–3–4–5–6      (b) 1–2–4–5–6

(c) 1–2–3–5–6        (d) 1–2–4–3–5–6

**[HPSC - 2014]**

**39.** In PERT analysis the time estimates of activities and probability of their occurrence follow

(a) Normal distribution curve

(b) Poissons's distribution curve

(c) $\beta$-distribution curve

(d) Binomial distribution curve

**[HPSC - 2014]**

**40.** In critical path method, when a particular task is performed, it is called :

(a) Activity          (b) Event

(c) Float             (d) Contract

**[HPSC - 2014]**

**41.** In construction project planning, free float can affect which of the following ?

(a) Succeeding activity

(b) Preceding activity

(c) Overall completion

(d) Only that particular activity

[HPSC - 2014]

**42.** PERT stands for

(a) Program Estimation and Reporting Technique

(b) Process Estimation and Review Technique

(c) Program Evaluation and Review Technique

(d) Planning Estimation and Review Technique

[HPSC - 2014]

**43.** Slack time in PERT analysis

(a) Can never be greater than zero

(b) Is always zero for critical activities

(c) Can never be less than zero

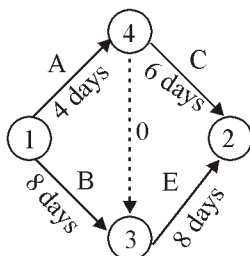(d) Is minumum for critical events

[HPSC - 2014]

**44.** Slack time refers to

(a) An activity

(b) An event

(c) Both event & activity

(d) None of the above

[HPSC - 2014]

**45.** The given figures shows the arrow diagram for a particular project. The arrow A is known as



(a) Critical activity  (b) Logic arrow

(c) Dummy activity  (d) Subcritical activity

[HPSC - 2014]

**46.** The chart which gives an estimate about the amount of materials handling between various work stations is known as

(a) Flow chart     (b) Process chart

(c) Travel chart    (d) Operation chart

[HPSC - 2014]

**47.** Time and progress chart of a construction, is known as :

(a) Bar chart

(b) Gantt chart
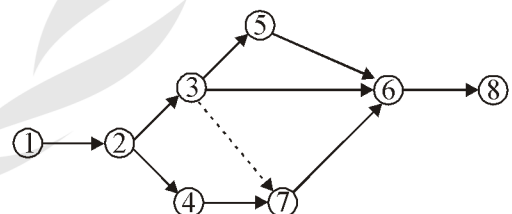
(c) Modified Milestone

(d) All of the above

[HPSC - 2014]

**48.** Gantt chart provides information about-

(a) Break even point analysis

(b) Production schedule

(c) Material handling layout

(d) Determining selling price

[HPSC - 2014]

**49.** With reference to the network shown in below figure which statement is incorrect?



(a) Event 7 precedes event 6

(b) Event 5 follows event 3

(c) Events 3 and 4 occur after event 2

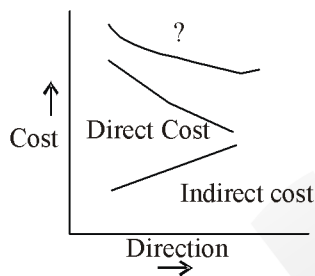(d) Event 7 can occur after event 4

[RSMSSB-JE-2020]

**50.** The performance of a specific task in CPM is known as

(a) Contract     (b) Event

(c) Dummy      (d) Activity

[RSMSSB-JE-2020]

## ANSWERS SHEET

1. *Ans. (b)*
2. *Ans. (c)*
3. *Ans. (c)*
4. *Ans. (d)*
5. *Ans. (c)*
6. *Ans. (d)*



7. *Ans. (c)*
8. *Ans. (c)*
9. *Ans. (b)*
10. *Ans. (c)*
11. *Ans. (d)*
12. *Ans. (b)*
13. *Ans. (a)*
14. **Ans. (c)**
15. *Ans. (a)*
16. *Ans. (a)*
17. *Ans. (c)*
18. *Ans. (c)*
19. *Ans. (c)*
20. *Ans. (d)*
21. *Ans. (b)*
22. *Ans. (a)*
23. *Ans. (b)*
24. *Ans. (b)*
25. *Ans. (b)*
26. *Ans. (d)*
27. *Ans. (a)*
28. *Ans. (d)*

29. *Ans. (d)*
30. *Ans. (b)*
31. *Ans. (c)*
32. *Ans. (a)*
33. *Ans. (a)*
34. *Ans. (d)*
35. *Ans. (b)*
36. *Ans. (c)*
37. *Ans. (c)*
38. *Ans. (a)*
39. *Ans. (c)*
40. *Ans. (a)*
41. *Ans. (b)*
42. *Ans. (c)*
43. *Ans. (b)*
44. *Ans. (b)*
45. *Ans. (d)*
46. *Ans. (c)*
47. *Ans. (c)*
48. *Ans. (b)*
49. *Ans. (b)*
50. *Ans. (d)*
51. *Ans. (b)*
52. *Ans. (a)*
53. *Ans. (a)*
54. *Ans.(d)*

**Limitation of bar chart:**

1. Lack of degree of detail: A bar chart does not show the progress of work and hence it can not be used as a control device.

2. A bar chart is unable to depict the interdependencies of various activities clearly.

3. No provision to account for time uncertainties.

# UNIT-IV

# SOIL MECHANICS & FOUNDATION

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# PROPERTIES OF SOILS

**CHAPTER**

**1**

## OBJECTIVE QUESTIONS

1. The relationship between water content (w%) and number of blows (N) in soils, as obtained from casagrande's liquid limit device, is given by

   $w = 20 - \log_{10} N$

   The liquid limit of the soil is

   (a) 15.6%          (b) 16.6%

   (c) 17.6%          (d) 18.6%

2. Swelling potential of a soil is indicated by :

   (a) Activity of the soil

   (b) Sensitivity of the soil

   (c) Permeability of the soil

   (d) Compressibility of the soil

3. Consider the following statements

   Clay which exhibit high activity

   1. Contain montmorillonite

   2. Contain kaolinite

   3. Have a high silt content

   4. Have a high plasticity index

   5. Have a low plasticity index

   of these statements

   (a) 1, 3 and 5 are correct

   (b) 2, 3 and 5 are correct

   (c) 2 and 4 are correct

   (d) 1 and 4 are correct

4. Which one of the following parameters can be used to estimate the angle of internal friction of a sandy soil?

   (a) Particle size

   (b) Roughness of particle

   (c) Particle size distribution

   (d) Density index

5. For a soil, if the sensitivity value from 2.0 to 4.0 then such a soil is classified as

   (a) Extra sensitive

   (b) Moderately sensitive

   (c) Little sensitive

   (d) Sensitive

   **[DFCCIL - 2018]**

6. A soil has a bulk density of 1.80 g/cm$^3$ at a water content of 5%. If the void ratio remains constant, then its bulk density for a water content of 10% will be

   (a) 1.98 g/cm$^3$          (b) 1.88 g/cm$^3$

   (c) 1.80 g/cm$^3$          (d) 1.70 g/cm$^3$

7. A soil sample has a shrinkage limit of 10% and specific gravity of soil solids as 2.7. The porosity of the soil at shrinkage limit is

   (a) 21.2%          (b) 27%

   (c) 73%          (d) 78.8%

8. A soil has liquid limit of 60%, plastic limit of 35% and shrinkage limit of 20% and it has a natural moisture content of 50%. The liquidity index of soil is

   (a) 1.5          (b) 1.25

   (c) 0.6          (d) 0.4

9. If the water content of a fully saturated soil mass is 100%, then the voids ratio of the sample is

   (a) Less than specific gravity of soil

   (b) Equal to specific gravity of soil

   (c) Greater than specific gravity of soil

   (d) Independent of specific gravity of soil

10. Liquidity index (in%) is equal to

(a) $\dfrac{w_p - w}{I_p} \times 100$    (b) $\dfrac{w_L - w_p}{I_p} \times 100$

(c) $\dfrac{w_L - w}{I_p} \times 100$    (d) $\dfrac{w - w_p}{I_p} \times 100$

11. If the soil sample has water content = 20 % ; specific gravity = 2.70; and void ratio = 0.75 then degree of saturation of the given sample is–

(a) 68%       (b) 13.8%

(c) 54%       (d) None of these

**[RPSC.VPITI-2016]**

12. If the void ratio (e) of a given soil sample is 0.77 then its porosity (n) is : –

(a) 0.435%

(b) 43.50%

(c) 23.3%

(d) Data given are insufficient to calculate porosity

**[RPSC.VPITI - 2016]**

13. A soil sample is having a specific gravity 2.60 and a void ratio of 0.78. The water content required to fully saturate the soil at that void ratio would be

(a) 10%       (b) 30%

(c) 50%       (d) 70%

14. The relationship between discharge velocity V and seepage velocity $V_s$ is

(a) $V_s = V/n$       (b) $V_s = V/e$

(c) $V_s = Vn$        (d) $V_s = Ve$

15. Number of phases in soil mass is : –

(a) 1         (b) 2

(c) 3         (d) 4

**[RPSC - 2016]**

16. For determination of water content, the wet soil is dried in oven for 24 hours at

(a) 50°C       (b) 100°C

(c) 105°C      (d) 155°C

17. In a wet soil mass, air occupies one-sixth of its volume and water occupies one-third of its volume. The void ratio of the soil is :

(a) 0.25       (b) 0.5

(c) 1          (d) 1.5

**[LMRC.JE - 2017]**

18. You are given a sample of soil containing coarse grains to determine its water content. What will you use for this purpose ?

(a) Pycnometer

(b) Oven-drying method

(c) Calcium carbide method

(d) Alcohol method

**[LMRC.JE - 2016]**

19. The smallest water content below which soil sample will not reduce its volume any further is known

(a) Plasticity limit    (b) Plasticity index

(c) Drying limit        (d) Shrinkage limit

**[PEB-SUB ER. - 2017]**

20. The ratio of unconfined compressive strength of an undisturbed sample of soil to that of a remoulded sample, at the same water content, is known as

(a) Activity       (b) Damping

(c) Plasticity     (d) Sensitivity

21. Clay whose activity coefficient is more than 1.2 is termed as ____.

(a) Fine clay      (b) Inactive clay

(c) Active clay    (d) Normal clay

**[PEB-SUB ER - 2017]**

22. Which one of the following relations is NOT correct?

Where, e = voids ratio, n = porosity, w = water content, S = degree of saturation,

$\gamma_{sat}$ = saturated unit weight, $\gamma_w$ = unit weight of water

(a) $e = \dfrac{n}{1-n}$       (b) $e = \dfrac{wG}{S}$

(c) $n = \dfrac{e}{1-e}$       (d) $\gamma_{sat} = \dfrac{(G+e)\gamma_w}{1+e}$

**[PEB-SUB ER - 2017]**

23. For a soil having L.L. = 54%, P.L. = 25% and natural moisture content of 29%, liquidity index is given by-

    (a) 0.138          (b) 2.76

    (c) 0.862          (d) 7.250

24. Relative density of coarse grained soil is given by the relation-

    (a) $\dfrac{e_{max} - e}{e_{max} - e_{min}} \times 100$

    (b) $\dfrac{e_{max} + e}{e_{max} - e_{min}} \times 100$

    (c) $\dfrac{e_{max} - e}{e_{max} + e_{min}} \times 100$

    (d) $\dfrac{e_{max} + e}{e_{max} + e_{min}} \times 100$

    **[DFCCIL - 2018, DFCCIL - 2018]**

25. If the porosity of soil is close to 33%, then its void ratio will be closer to ___.

    (a) 0.33          (b) 0.5

    (c) 0.8          (d) 1

    **[PEB-SUB ER - 2017]**

26. What is plastic limit of soil?

    (a) The minimum water content at which the soil just begins to crumble when rolled into threads 3 mm in diameter

    (b) The maximum water content at which the soil just begins to crumble when rolled into threads 3 mm in diameter

    (c) The exact water content at which the soil just begins to crumble when rolled into threads 3 mm in diameter

    (d) None of the above

    **[GESCOM.AE - 2016]**

27. Which of the following is a property of black cotton soil?

    (a) It does not retain moisture

    (b) It swells excessively when wet and shrinks excessively when dry

    (c) It becomes soft when dry

    (d) It is very rocky

    **[KPSC-JE, GESCOM.AE - 2016]**

28. Which of the following is an example of collapsible soils ?

    (a) Black cotton          (b) Gravel

    (c) Loess          (d) Halite

    **[KPSC.JE - 2016]**

29. The ratio of the weight of given volume of soil solids to the weight of an equal volume of distilled water at the given temperature, is called

    (a) Porosity          (b) Specific gravity

    (c) Void ratio          (d) Water content

    **[KPSC.JE - 2016]**

30. Which of the soils is transported through wind

    (a) Loess          (b) Talus

    (c) Drift          (d) Sand dunes

    **[PHED.RAJ - 2017]**

31. If the degree of saturation of a partially saturated soil is 60% then air content of the soil is

    (a) 40%          (b) 60%

    (c) 80%          (d) 100%

    **[PHED.RAJ - 2016]**

32. The water content of soil which represents the boundary between plastic state and liquid state is known as

    (a) Liquid limit          (b) Plastic limit

    (c) Shrinkage limit   (d) Plasticity index

    **[PHED.RAJ - 2017]**

33. A dry soil has a specific mass of 1.35. If specific gravity of solids is 2.7, then voids ratio is

    (a) 0.5          (b) 1.0

    (c) 1.5          (d) 2.0

    **[PHED.RAJ - 2016]**

34. In a soil mass, the volume of solids is equal to volume of voids. The values of porosity and void ratio

    (a) 1.0 and 0.0      (b) 0.0 and 1.0

    (c) 0.5 and 1.0      (d) 1.0 and 0.5

35. If the consistency index of a natural soil is zero, then the natural water content of the soil is equal to its

    (a) Liquid limit      (b) Plastic limit

    (c) Plasticity index   (d) Shrinkage limit

36. The soil which is deposit in sea water

    (a) Loess            (b) Glacial

    (c) Alluvial          (d) Marine

    **[TSPSC.AE - 2015]**

37. Drift is the soil transported by

    (a) Wind             (b) Water

    (c) Glacier           (d) Gravitational force

    **[LBS-ASST.PROF - 2017]**

38. The ratio of volume of voids to volume of soil solids in a given soil mass is known as

    (a) Void ratio        (b) Porosity

    (c) Air content       (d) Water content

    **[DSSB-JE - 2022]**

39. A soil has liquid limit = 32, plastic limit = 18, shrinkage limit = 8 and natural moisture content = 22%. What will be its liquidity index and plasticity index?

    (a) 0.67 and 15       (b) 0.285 and 14

    (c) 0.67 and 25       (d) 0.33 and 20

    **[ISRO - 2015]**

40. A cohesive soil yields a maximum dry density of 18 kN/m$^3$ during a Standard Proctor Compaction test. If the specific gravity is 2.65, what would be its void ratio?

    (a) 0.552            (b) 0.444

    (c) 0.712            (d) 0.583

    **[ISRO - 2015]**

41. What will be the dry unit weight (in-kN/m$^3$) for a saturated soil, given that moisture content (w) =35% and specific gravity of soil ($\gamma_s$) =2.5 ?

    (a) 12.08 kN/m$^3$     (b) 13.08 kN/m$^3$

    (c) 11.08 kN/m$^3$     (d) 10.68 kN/m$^3$

    **[DFCCIL - 2018]**

42. The plasticity index may be defined as the numerical difference between :

    (a) Liquid limit and plastic limit

    (b) Plastic limit and shrinkage limit

    (c) Liquid limit and shrinkage limit

    (d) None of the above

    **[NBCC - 2017]**

43. Water content of soils can be accurately determined by :

    (a) Calcium carbide  (b) Sand bath

    (c) Alcohol method   (d) Oven drying method

    **[RPSC-ACF-2011, NBCC - 2017, DDA.JE - 2018]**

44. The bulk density of a material depends on

    (a) Void ratio        (b) Moisture content

    (c) Porosity         (d) All of these

    **[Chandigarh .JE - 2016]**

45. The ratio of volume of water present in a given soil mass to the total volume of its voids is known as

    (a) Porosity         (b) Void ratio

    (c) Percentage voids  (d) Degree of saturation

    **[ISRO - 2018]**

46. A soil sample is partially saturated. Its natural moisture content was found to be 22% and bulk density 2 gms/cc. If the specific gravity of the solid particles sis 2.65 and the density of water is 1 gms/cc, the void ratio of the sample is

    (a) 0.3825           (b) 0.6165

    (c) 0.8188           (d) 0.9122

    **[ISRO - 2018]**

## ANSWERS SHEET

**1.**   *Ans. (d)*

In casagrande's liquid limit test the liquid limit is the water content corresponding to N = 25, as obtained from plot.

$$w = 20 - \log_{10} 25 = 18.6\%$$

**2.**   *Ans. (a)*

Swelling potential of a soil is indicated by activity of soil.

**3.**   *Ans. (d)*

Clay which exhibit high activity contains montmorillonite and high plasticity index.

**4.**   *Ans. (d)*

Roughness of particle used to estimate the angle of internal friction of a sandi soil.

**5.**   *Ans. (b)*

| Sensitivity | Classification |
|---|---|
| 1–2 | Slightly sensitive |
| 2–4 | Medium sensitive |
| 4–8 | Very sensitive |
| 8–16 | Slightly quick |

**6.**   *Ans. (b)*

Void ratio is same so dry density will also same

$$\gamma_{d_1} = \gamma_{d_2}$$

$$\frac{\gamma_{b_1}}{1 + w_1} = \frac{\gamma_{b_2}}{1 + w_2}$$

$$\Rightarrow \quad \frac{1.8}{1 + 0.05} = \frac{\gamma_{b_2}}{1 + 0.1}$$

$$\Rightarrow \quad \gamma_{b_2} = 1.8 \times \frac{1.1}{1.05} = 1.88 \text{ g/cm}^3$$

**7.**   *Ans. (a)*

At shrinkage limit soil is fully saturated i.e. S = 1

given, $W_s = 10\%$

$$G = 2.7$$

$$n = ?$$

$$S.e = W.G.$$

$$\Rightarrow \quad S \times e = 0.10 \times 2.7$$

$$\Rightarrow \quad e = 0.27$$

$$\therefore \quad n = \frac{e}{1+e} = \frac{0.27}{1 + 0.27} = 21.2\%$$

**8.**   *Ans. (c)*

$$I_L = \frac{w_n - w_p}{I_p}$$

$$= \frac{w_n - w_P}{w_L - w_P}$$

$$= \frac{50 - 35}{60 - 35} = 0.60$$

**9.**   *Ans. (b)*

$$S = 1$$

$$W = 0.100$$

$$e = ?$$

$$W.G = S.e$$

$$1 \times G = 1 \times e$$

$$\Rightarrow \quad e = G$$

**10**   *Ans. (d)*

$$I_L = \frac{W_n - W_P}{I_P} \times 100$$

$$= \frac{W_n - W_P}{W_L - W_P} \times 100$$

**11.**   *Ans. (d)*

$$w = 20\%$$

$$G = 2.70$$

$$e = 0.75$$

$$eS = wG$$

$$0.75 \times S = 20 \times 2.70$$

$$S = 72\%$$

**12. Ans. (b)**

$$n = \frac{e}{1+e} = \frac{0.77}{1+0.77} = 0.435 \times 100$$

$$n = 43.50\%$$

**13. Ans. (b)**

Given

$$G = 2.6,\ e = 0.78,$$

$$S = 100\%\ W = ?$$

$$Se = Gw$$

$$w = \frac{100 \times 0.78}{2.6}$$

$$w = 30\ \%$$

**14. Ans. (a)**

$$\frac{V_S}{V} = \frac{1}{n}$$

$$\Rightarrow \qquad V_S = \frac{V}{n}$$

**15. Ans. (c)**

| air |
|-----|
| water |
| solid |

**16. Ans. (c)**

For determination of water content, the wet soil is dried in hot air oven for 24 hrs at temperature $110^\circ \pm 5^\circ C$

**17. Ans. (c)**

$$e = \frac{V_v}{V_s},\ V_a = \frac{V}{6},\ V_w = \frac{V}{3}$$

$$V_V = V_a + V_w$$

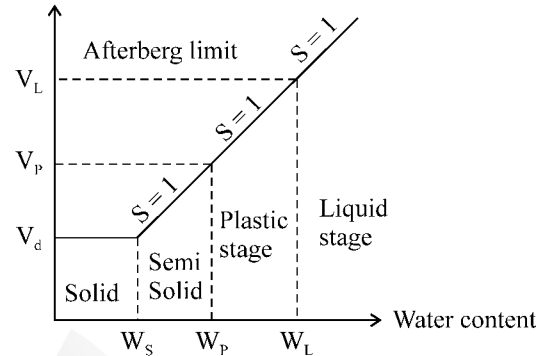$$= \frac{V}{6} + \frac{V}{3} = \frac{V}{2}$$

$$V = V_a + V_w + V_s$$

$$V_s = V - \frac{V}{6} - \frac{V}{3} = \frac{V}{2}$$

$$e = \frac{V/2}{V/2} = 1$$

$$e = 1$$

**18. Ans. (a)**

Pycnometer is used for coarse grain soil. If use in fine grain soil kerosene is use as a standard fluid.

**19. Ans. (d)**



$W_S$ = It is minimum water content at which soil is just saturated or it is the smallest water content below which soil sample will not reduce its volume.

**20. Ans. (d)**

**Sensitivity :** Ratio of unconfined compressive strength (UCS) of soil in its undisturbed state to unconfined compressive strength (UCS) in remoulded state.

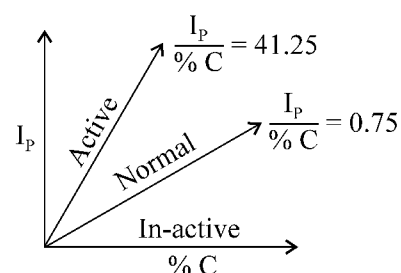$$S_t = \frac{(UCS)\ undisturbed}{(UCS)\ remoulded}$$

$$= \frac{Undisturbed\ shear\ strength}{Remoulded\ shear\ strength}$$

**21. Ans. (c)**

**Activity ($A_C$) :**

The ratio of plasticity index ($I_P$) of soil to percentage of clay particle (% C) in soil is called activity.

$$Activity = \frac{I_P}{\%C} = A\text{–line}$$

| Activity | Description |
|----------|-------------|
| < 0.75 | Inactive |
| 0.75 – 1.25 | Normal |
| > 1.25 | Active |

**22.** *Ans. (c)*

We know that,

(i)     $n = \dfrac{e}{1+e} \Rightarrow n + n \cdot e = e$

$\Rightarrow \qquad n = (1-n) \cdot e$

$\Rightarrow \qquad e = \dfrac{n}{1-n}$

(ii)     $S \cdot e = W \cdot G$

$\Rightarrow \qquad e = \dfrac{W \cdot G}{S}$

(iii)     $\gamma = \left(\dfrac{G + S \cdot e}{1+e}\right) \cdot \gamma_w$

$\gamma_{sept} = \left(\dfrac{G + 1 + e}{1+e}\right) \cdot \gamma_w$

**23.** *Ans. (a)*

$I_n = \dfrac{W_n - W_P}{W_L - W_P}$

$= \dfrac{29 - 25}{54 - 25} = \dfrac{4}{29}$

$= 0.1379 = 0.138$

**24.** *Ans. (a)*

**25.** *Ans. (b)*

$e = \dfrac{n}{1-n} = \dfrac{0.33}{1-0.33}$

$e = 0.492$

**26.** *Ans. (a)*

**Plastic limit :**

It is the water content in clay soil below which

1.   It stop to behave like a plastic material.

2.   It starts to crumble when rolled in threads of 3mm diameter.

**27.** *Ans. (b)*

**28.** *Ans. (c)*

**29.** *Ans. (b)*

**30.** *Ans. (d)*

**31.** *Ans. (a)*

$a_c = 1 - S$

$a_c = 1 - 0.60 = 0.40$

$a_c = 40\ \%$

**32.** *Ans. (a)*

**33.** *Ans. (b)*

Specific mass $= \dfrac{\gamma_d}{\gamma_w} = 1.35$

$G = 2.7$

$\gamma_d = \dfrac{G\ \gamma_w}{1+e}$

$\dfrac{\gamma_d}{\gamma_w} = \dfrac{2.7}{1+e}$

$1.35 = \dfrac{2.7}{1+e}$

$1.35e + 1.35 = 2.7$

$e = \dfrac{2.7 - 1.35}{1.35} = 1$

$e = 1$

**34.** *Ans. (c)*

$V_V = V_S$

$\therefore \qquad e = \dfrac{V_V}{V_S} = 1$

$n = \dfrac{e}{1+e} = \dfrac{1}{2} = 0.5$

**35.** *Ans. (a)*

$I_C = 0$

$\because \qquad I_C = \dfrac{W_L - W_n}{I_P}$ and,

$I_L = \dfrac{W_n - W_P}{I_P}$

$\Rightarrow \qquad 0 = \dfrac{W_L - W_n}{W_L - W_P}$

$\Rightarrow \qquad W_L - W_n = 0$

$\Rightarrow \qquad W_L = W_n$

**36.** *Ans.* *(d)*

**37.** *Ans.* *(c)*

**38.** *Ans.* *(a)*

$e = \dfrac{V_V}{V_S}$

**39.** *Ans.* *(b)*

$w_L = 32\%,$

$w_P = 18\%, \; w_S = 8\%, \; w_N = 22\%$

$I_P = w_L - w_P = 32 - 18 = 14\%$

$I_L = \dfrac{w_N - w_P}{I_P}$

$I_L = \dfrac{22 - 18}{I_p} = \dfrac{4}{14} = \dfrac{2}{7} = 0.285$

**40.** *Ans.* *(b)*

$\gamma_d = \dfrac{G\gamma_w}{1+e}$

$\Rightarrow \qquad e = \dfrac{G\gamma_w}{\gamma_d} - 1$

$e = \dfrac{2.65 \times 9.81}{18} - 1$

$e = 0.44425$

**41.** *Ans.* *(b)*

$e = \dfrac{W.G}{S}$

$= \dfrac{0.35 \times 2.5}{1}$

$= 0.875$

$\gamma_d = \dfrac{G.\gamma_w}{1+e}$

$= \dfrac{2.5 \times 9.81}{1.875}$

$= 13.08 \text{kN/m}^3$

**42.** *Ans.* *(a)*

$I_P = W_L - W_P$

**43.** *Ans.* *(d)*

**44.** *Ans.* *(d)*

$\gamma = \left( \dfrac{G + S \cdot e}{1+e} \right) \cdot \gamma_w$

$= \left( \dfrac{G + W \cdot G}{1+e} \right) \cdot \gamma_W$

where, $\qquad n = \dfrac{e}{1+e}$

$e = \dfrac{n}{1-n}$

$\therefore \qquad \gamma = \dfrac{(1+W) \cdot G \cdot \gamma_W}{1 + \dfrac{n}{1-n}}$

$= (1+W) \cdot (1-n) \cdot \gamma_W$

**45.** *Ans.* *(d)*

Degree of saturation

$S = \dfrac{\text{Volume of water}}{\text{Volume of void}} \times 100$

$= \dfrac{V_W}{V_V} \times 100$

**46.** *Ans.* *(b)*

$W = 22\%$

$\gamma_b = 2 \text{ gm/cc}$

$G = 2.65$

$\gamma_w = 1 \text{ gm/cc}$

$\gamma_b = \dfrac{G(1+w)\gamma_w}{1+e}$

$e = \dfrac{G(1+w)\gamma_w}{\gamma_b} - 1$

$e = \dfrac{2.65(1+0.22)}{2} - 1$

$e = 0.6165$

**47.** *Ans.* *(d)*

**48.** *Ans.* *(c)*