MIXING, COMPACTING AND CURING OF CONCRETE.

1. Mixing of concrete.

(*a*) **Hand mixing**

(*b*) **Machine mixing:** It is done by

(*i*) Batch mixture—small scale

(*ii*) Continuous mixture-large scale

In no case mixing be done for less than 2 minuts

- The optimum number of revolutions over which concrete is required to mixed in a mier machine is 20.

(*a*) **Hand mixing :** Sand and cement in appropriate proportions are mixed first in a dry state. The coarse aggregate is then added and the whole mixture is mixed thoroughly with the help of shovels. The amount of water is then sprinkled over the mix.

(*b*) **Machine mixing :** Coarse aggregate should be fed first, then sand and lastly cement. In the revolving state, when the three get thoroughly mixed, water should be added.

2. Transporting concrete.

3. Placing concrete.

- The concrete should be placed and compacted before setting commences and should not subsequently be disturbed.
- Placed concrete should be roughened. It should then be swept clean, thoroughly weted and covered with a 13 mm. layer of mortar composed of cement and sand in the same ratio as the cement and sand in the concrete mix. This 13 mm. layer of mortar should be freshly mixed and placed immediately before the placing of the concrete. The surface should then coated with neat cement grout.

4. Compacting concrete: Concrete should be thoroughly compacted during the operation of placing and thoroughly worked around the reinforcement.

- **Vibrators are of three general types:**

(*i*) Internal vibrator or immersion vibrator

(*ii*) External vibrator or form vibrators

(*iii*) Surface vibrator : used in concrete road construction.

- Concrete may be compacted manually by rodding, tamping or hammering for thin vertical member-rodding.
- For slabs temping is done for compacting concrete.

5. Curing concrete :

- The normal period is between 7 to 10 days
- Curing with the help of steam or hot water, resulting in rapid development of strength.

STEEL REINFORCEMENT :

- In big housing projects, high yield strength deformed bars (HYSD bars) are in common use.
- Fe 415 and Fe 500 use high strength concrete of M20 grade and higher.
- Compression in bars in a beam or a slab where the compressive resistance of the concrete is taken in to account.
- The calculated compressive stress in surrounding concrete multiplied by 1.5 m or σ_{sc} which ever is lower.
- The Indian Standard code for concrete was first published in 1953 under the title *"code of practice for plain and reinforced concrete for general building construction"*.
- The code was revised in 1964 and published under modified title *"code of practice for plain and reinforced concrete"*.
- The nominal maximum size of coarse aggregate should not be greater than one-fourth of the minimum thickness of the member. For reinforced concrete work, aggregates having a nominal size of 20 mm are generally considered satisfactory.
- For heavy reinforced concrete members as in the case of ribs or main beams, the nominal maximum size of the aggregate should usually be restricted to 5mm less than the minimum clear distance between the main bars or 5 mm less than the minimum cover to the reinforcement whichever is smaller.
- Potable water is generally considered satisfactory for mixing concrete and curing.

Permissible limit for solids

Organic	—	200mg/l.
Inorganic	—	3000 mg/1.
Sulphates (as SO_4)	—	500 mg/1.
Chlorides (as Cl)	—	2000 mg/1 for plain concrete work 1000 mg/1 for reinforcement concrete work
Suspended matter	—	2000 mg/1

- pH value of water shall be generally not less than 6.

REINFORCEMENT.

All reinforcement shall be free from loose mill scales, loose rust and coats of paints, oil, mud or other coatings which more destroy or reduce bond.

The modulus of elasticity of steel shall be taken as 200 kN/mm^2 or 2×10^5 N/mm^2.

CONCRETE.

The characteristic strength is defined as the strength of material below which not more than 5% of the test results are expected to fall.

Grade of concrete	Specified characteristic compressive strength at 28 days (f_{ck})	Time	Age factor
M10	10 N/mm^2	1	1.0
M15	15 N/mm^2	3	1.10
M20	230 N/mm^2	6	1.15
		12	1.20

- In the designation of concrete mix, letter M refers to the mix and the number to the specified characteristic compressive of strength of 15 cm. cube at 28 days; expressed in N/mm^2.
- In the absence of test data, the approximate value of the total shrinkage strain for design may be taken as 0.0003, as long as the stress in concrete does not exceed one third of its characteristic compressive strength.

DURABILITY.

One of the main characteristics influencing the durability of any concrete is its permeability. With strong, dense aggregates, a suitable low permeability is achieved by having a sufficient low water cement ratio.

CONCRETE MIX PROPORTIONING.

The determination of the proportions of cement, aggregates and water to attain the required strengths shall be made as follows :

(*a*) By designing the concrete mix, such concrete shall be called design mix concrete, or

(*b*) By adopting nominal concrete mix, such concrete shall be called nominal mix concrete.

- Design mix concrete is preferred to nominal mix.
- Concrete of each grade shall be analysed separately to determine its standard deviation.
- Standard deviation

$$S = \sqrt{\frac{\Sigma \Delta^2}{n-1}}$$

where, Δ = Deviation of the individual test strength from the average strength of n samples, and

n = Number of sample test results.

ACCEPTANCE CRITERIA.

The concrete shall be deemed to comply with the strength requirement if :

(*a*) Every sample has a test strength not less than the f_{ck} value; or

(*b*) The strength of one or more samples though less than the f_{ck}, is in each case not less than the greater of :

(*i*) characteristic strength minus 1.35 times the standard deviation, and

(*ii*) 0.80 times the characteristic strength.

(*c*) The average strength of all the samples is not less than the characteristic strength plus

$$\left[1.65 - \frac{1.65}{\text{number of samples}}\right]$$

times the standard deviation.

- The concrete shall be deemed not to comply with the strength requirements if:

(*a*) The strength of any sample is less than the greater of:

(*i*) the characteristic strength minus 1.35 times the standard deviation; and

(*ii*) 0.80 times the characteristic strength; or

(*b*) The average strength of all the samples is less than the characteristic strength plus

$$\left[1.65 - \frac{3}{\text{number of samples}}\right]$$

time the standard deviation.

- The final deflection due to all loads including the effects of temperature, creep and shrinkage and measured from as last level of supports of floors roofs and all other horizontal members should not exceed $\frac{\text{Span}}{250}$.

EXERCISE - I

1. The strength and quality of concrete depends on
(*a*) aggregate shape
(*b*) aggregate grading
(*c*) surface area of the aggregate
(*d*) All of the above

2. The lower water-cement ratio in concrete produces
(*a*) more density
(*b*) small creep and shrinkage
(*c*) more bond
(*d*) All of the above

3. The entrained air in concrete
(*a*) increases workability
(*b*) decreases workability
(*c*) increases strength
(*d*) None of the above

4. Separation of ingredients from concrete during transportation is known as
(*a*) Bleeding (*b*) Creep
(*c*) Segregation (*d*) Shrinkage

5. After casting, an ordinary cement concrete on drying
(*a*) shrinks (*b*) expands
(*c*) remains unchanged (*d*) can expand or shrink

6. The split strength of concrete can be determined by
(*a*) Brazilion test (*b*) Vicat's apparatus
(*c*) Cube test (*d*) Briquettes test

7. The workability of concrete can be improved by
(*a*) more sand
(*b*) more cement
(*c*) more fine aggregate
(*d*) fineness of coarse aggregate

8. The following compound that helps in obtaining early strength of cement concrete is
(*a*) Tricalcium silicate (*b*) Di aluminate
(*c*) Tri aluminate (*d*) None of these

9. An air entraining agent when added in concrete improves
(*a*) strength (*b*) workability
(*c*) density (*d*) durability

10. Strength of concrete is directly proportional to
(*a*) cement water ratio
(*b*) water cement ratio
(*c*) sand cement ratio
(*d*) water aggregate ratio

11. Strength of concrete increase with
(*a*) increase in water cement ratio
(*b*) increase in fineness of cement
(*c*) decrease in curing time
(*d*) decrease in size of aggregate

12. Approx ratio of the strength of the cement conc of 7 days to that of 28 days
(*a*) 0.56 (*b*) 0.85
(*c*) 1.0 (*d*) 1.15

13. Approximate ratio of direct tensile strength to flexural strength is
(*a*) 0.25 (*b*) 0.33
(*c*) 0.5 (*d*) 0.90

14. Stress-strain curve for cement concrete is almost linear upto
(*a*) 0.25 times ultimate stress
(*b*) 0.35 times ultimate stress
(*c*) 0.5 times ultimate stress
(*d*) None of the above

15. Durability of concrete is proportional to
(*a*) sand content
(*b*) water cement ratio
(*c*) aggregate ratio
(*d*) cement aggregate ratio

16. Strength of concrete is
(*a*) $f_{ck} = K\left(\frac{C}{W+C+A}\right)^2$
(*b*) $f_{ck} = K\left(\frac{C+A}{W+C+A}\right)^2$
(*c*) $f_{ck} = K\left(\frac{C+W}{W+C+A}\right)^2$
(*d*) $f_{ck} = K\left(\frac{C+W}{C+W+A}\right)^2$

where f_{ck} = strength of concrete.
A, C, W are the absolute volumes of aggregate, cement, and water
K = constant.

17. Relation between the modulus of rupture for splitting strength f_{cs} and direct tensile f_{cst} strength is given by

(*a*) $f_{cst} > f_{cs} > f_{ct}$ (*b*) $f_{cr} < f_{cs} < f_{ct}$

(*c*) $f_{cr} = f_{cs} = f_{ct}$ (*d*) none of the above

18. Relation between modulus of rupture f_{cr} and cube strength of concrete f_{ck} is

(*a*) $f_{cr} = 0.35\sqrt{f_{ck}}$ (*b*) $f_{cr} = 0.7\sqrt{f_{ck}}$

(*c*) $f_{cr} = 0.7\sqrt{f_{ck}}$ (*d*) $f_{cr} = 1.2\sqrt{f_{ck}}$

19. The stress strain relation of concrete under compression can be expressed as

(*a*) $f_c = \mathrm{E}\left(1 - \frac{e}{2e_0}\right)$ (*b*) $f_{ct} = f_{eo}\frac{(1-f_c)}{\mathrm{E}}$

(*c*) $f_{ct} = \mathrm{E}\sqrt{e(1-e)}$ (*d*) $f_{ct} = \left(\frac{f^2}{\mathrm{E}+f_c}\right)\frac{1}{\mathrm{E}}$

where

e_o = strain

e_o = strain at ultimate stress

f_c = stress in concrete

E = Young's modulus of Elasticity

20. The modulus of rupture is a measure of

(*a*) Direct tensile strength

(*b*) Split tensile strength

(*c*) Flexural tensile strength

(*d*) Direct compressive strength

21. Poisson's ratio for concrete

(*a*) increases with richer mix

(*b*) decreases with richer mix

(*c*) remains constant

(*d*) None of these

22. Design mix concrete is preferred over nominal mix concrete because

(*a*) strength of former is more

(*b*) cement content of latter is more

(*c*) it is easy to prepare former at site

(*d*) None of the above

23. If the slump of concrete mix is 60 mm its workability is

(*a*) low (*b*) medium

(*c*) high (*d*) very high

24. Segregation is responsible for

(*a*) honey comb concrete

(*b*) porous layers in concrete

(*c*) sand streaks in concrete

(*d*) All of the above

25. If the compaction factor is 0.95, the workability of concrete is

(*a*) very low (*b*) low

(*c*) medium (*d*) high

26. Slump test is a measure of

(*a*) Tensile strength

(*b*) Compressive strength

(*c*) Impact value

(*d*) Consistency

27. Concrete gains strength due to

(*a*) chemical action of cement with coarse aggregate

(*b*) hydration of cement

(*c*) evaporation of water

(*d*) All of the above

28. Shrinkage of concrete is directly proportional to

(*a*) water content in the mix

(*b*) sand content

(*c*) aggregate content

(*d*) aggregate to cement ratio

29. The factor of safety for steel is based on its

(*a*) yield stress

(*b*) ultimate stress

(*c*) Both (*a*) and (*b*)

(*d*) None of the above

30. The shrinkage in cement concrete decreases with

(*a*) addition of load

(*b*) removal of load

(*c*) removal of moisture

(*d*) addition of moisture

31. Placing of concrete should preferably be done at a temp of

(*a*) 10°C (*b*) 20°C

(*c*) 27 ± 2°C (*d*) 32°C

32. Under constant load the Creep strain in concrete is

(*a*) time dependent

(*b*) temperature dependent

(*c*) moisture dependent

(*d*) None of the above

33. Creep in concrete increases with

(*a*) increase in cement content

(*b*) decrease in curing time

(*c*) decrease in age of conc at the time of loading

(*d*) All of the above

34. Low temp during concrete laying
(*a*) increases strength
(*b*) decreases strength
(*c*) has no effect on strength
(*d*) depends on other factors

35. Light weight concrete is used in
(*a*) heat resistance
(*b*) air conditioning of buildings
(*c*) non load bearing wall
(*d*) reducing thickness

36. Addition of calcium chloride in concrete results in
(*a*) increased strength
(*b*) reduction in curing period
(*c*) retardation of loss of moisture
(*d*) All of the above

37. For protection from frost, concrete should be
(*a*) dense
(*b*) free from cracks
(*c*) adhesion between mortar and aggregate should be perfect
(*d*) All of the above

38. Adding a thin layer of cement mortar to the surface of concrete is known as
(*a*) Rendering (*b*) Admixing
(*c*) Rodding (*d*) Punning

39. The breaking up and remixing of concrete that has layers to set is called
(*a*) Resetting
(*d*) Double setting
(*c*) Knocking
(*d*) Time setting

40. The factor of safety for steel as compared to concrete is
(*a*) same (*b*) lower
(*c*) higher (*d*) None of these

41. ISI has specified the full strength of concrete after
(*a*) 7 days (*b*) 15 days
(*c*) 21 days (*d*) 28 days

42. The behaviour of concrete under instantaneous loads is
(*a*) Elastic
(*b*) Plastic
(*c*) Brittle
(*d*) Visco-elastic

43. The average value of creep coefficient for concrete is
(*a*) 5.0 (*b*) 4.0
(*c*) 3.0 (*d*) 2.0

44. Resonant frequency method is based on the assumption that
(*a*) strength of concrete increases with age
(*b*) richer mix give more stronger concrete
(*c*) resonant frequency is directly proportional to the square of the strength of concrete
(*d*) the modulus of elasticity of concrete goes on decreasing as the concrete quality deteriorates due to weathering

45. In a mix, if e is amount of air entrained and V is the reduction in quantity of water, the reduction in solid volume of sand is given by
(*a*) $e + \frac{V}{2}$ (*b*) $e - \frac{V}{2}$
(*c*) $e - V$ (*d*) None of the above

46. The percentage of fine aggregate to combined aggregate is equal to
(*a*) $\frac{X-Z}{Z-Y} \times 100$ (*b*) $\frac{X+Z}{Z-Y} \times 100$
(*c*) $\frac{X-Z}{Z+Y} \times 100$ (*d*) $\frac{Z-X}{Z+Y} \times 100$
where X, Y, Z are fineness modulii of coarse, fine and combined aggregate.

47. Water cement ratio by weight is
(*a*) higher as compared to that by volume
(*b*) lower as that compared to volume
(*c*) same as that by volume
(*d*) None of the above

48. At freezing point of water, concrete
(*a*) sets freely (*b*) sets slowing
(*c*) set rapidly (*d*) does not set

49. Steam curing is used in
(*a*) columns only
(*b*) long slabs and columns
(*c*) mass production of precast concrete
(*d*) All of the above

50. The coefficient of thermal expansion of cement concrete is
(*a*) 3×10^{-4} per°C (*b*) 3×10^{-5} per° C
(*c*) 3×10^{-6} per°C (*d*) 3×10^{-8} per°C

51. The main object of compaction of concrete is
(*a*) to eliminate air holes
(*b*) to achieve maximum density
(*c*) to get intimate contact between the concrete and embeded material
(*d*) All of the above

52. Too wet concrete may cause
(*a*) Segregation (*b*) Lower density
(*c*) Weakness of cone (*d*) All of the above

53. Non uniform compaction may cause the concrete
(*a*) Porous
(*b*) Reduced strength
(*c*) Non-homogeneous
(*d*) All of the above

54. The final operation of finishing floors, is known as
(*a*) floating (*b*) screeding
(*c*) trowelling (*d*) All of the above

55. The test most suitable for conc of very low workability is
(*a*) Slum test
(*b*) Compaction factor test
(*c*) Vee-Bee test
(*d*) All of the above

56. If the compaction factor of a concrete is 0.90, then the workability is
(*a*) very low (*b*) low
(*c*) medium (*d*) high

57. The presence of entrained air in air results in
(*a*) reduced bleeding
(*b*) lower density
(*c*) decreased strength at all ages
(*d*) All of the above

58. Calcium chloride as accelerating admixture is not recommanded for use with
(*a*) ordinary portland cement
(*b*) high alumina cement
(*c*) rapid hardening cement
(*d*) None of these

59. Steam curing is not used with
(*a*) ordinary portland cement
(*b*) rapid hardening cement
(*c*) high alumina cement
(*d*) All of the above

60. Curing period is minimum for concrete using
(*a*) rapid hardening cement
(*b*) low heat cement
(*c*) ordinary portland cement
(*d*) slag cement

61. For a satisfactory workable concrete with a constant W.C ratio increase in aggregate-cement ratio
(*a*) increases the strength of concrete
(*b*) decreases the strength of concrete
(*c*) No effect on the strength of concrete
(*d*) None of these

62. The aggregate possessing well defined edges formed at the intersection of roughly planar faces are called
(*a*) Flaky aggregate
(*b*) Elongated aggregate
(*c*) Angular aggregate
(*d*) Rounded aggregates

63. Los Angeles machine is used to test the aggregate for
(*a*) crushing strength
(*b*) abrasion resistance
(*c*) water absorption
(*d*) None of the above

64. Addition of sugar in concrete results in
(*a*) increase in setting time by about 1 hr
(*b*) increase in setting time by about 4 hr
(*c*) decrease in setting time by about 1 hr
(*d*) decrease in setting time by about 4 hr

65. The aggregate impact value of the aggregate used in
(*a*) building concrete is less then 45
(*b*) road pavement concrete is less then 30
(*c*) runway concrete is less then 30
(*d*) All of the above

66. Fineness modulus of sand is 2.5 and is graded as
(*a*) fine sand (*b*) medium sand
(*c*) coarse sand (*d*) very coarse sand

67. The three main raw material used for portland cement are
(*a*) lime stone, sandstone, clay
(*b*) lime, silica and clay
(*c*) lime, clay and gypsum
(*d*) silica, alumina, gypsum

68. The three main raw material for the manufacture of cement are
(*a*) sand stone, limestone
(*b*) chalk, clay
(*c*) chalk, limestone
(*d*) shale, clay

69. Increase in fineness modulus of aggregate indicates
(*a*) finer grading (*b*) irregular grading
(*c*) gap grading (*d*) None of the above

70. The early strength of cement is caused by
(*a*) tricalcuim silicate
(*b*) dicalcuim silicate
(*c*) tricalcuim aluminate
(*d*) gypsum

71. Later stage strength of cement is caused by
(*a*) tricalcuim silicate
(*b*) dicalcuim silicate
(*c*) tricalcuim aluminate
(*d*) gypsum aluminate

72. The initial and final setting times for ordinary portland cement are approximately related by
(*a*) T = 540 + t (*b*) T = 270 + t
(*c*) T = 90 + 1.2t (*d*) T = 90 + t
where T, *t* are final and initial setting time in minutes

73. The development of strength of cement and its fineness are
(*a*) directly proportional
(*b*) inversely proportional
(*c*) not related
(*d*) randomly related

74. Flash set of ordinary portland cement paste is
(*a*) premature hardening
(*b*) surface hardening only
(*c*) hardening without development of heat of hydration
(*d*) All of the above

75. The flash set of portland cement can be prevented by the addition of
(*a*) gypsum (*b*) pozzolana
(*c*) calcium chloride (*d*) calcium aluminate

76. The fineness of cement is tested by
(*a*) Le-Chatelier's apparatus
(*b*) Sieve analysis
(*c*) Vicat's needle
(*d*) Specific surface air permeability method

77. Unsoundness of cement due to magnesia can be determined by
(*a*) Autoclave test
(*b*) Vicat's needle
(*c*) Le-Chatelier's apparatus
(*d*) Normal consistency

78. The expansion of portland cement is caused by
(*a*) free lime (*b*) magnesia
(*c*) Both (*a*) and (*b*) (*d*) None of the above

79. The normal consistency of portland cement is about
(*a*) 50 % (*b*) 30 %
(*c*) 25 % (*d*) 15%

80. The density of portland cement is about in N/m^3
(*a*) 25,000 (*b*) 23,000
(*c*) 20,000 (*d*) 18,000

81. The soundness of portland cement can be improved by
(*a*) fine grinding
(*b*) addition of gypsum
(*c*) addition of lime
(*d*) addition of calcium chloride

82. The rapid hardening cement can be obtained by
(*a*) fine grinding of clinker
(*b*) addition of gypsum
(*c*) addition of calcium sulphate
(*d*) higher content of lime

83. White cement is produced in
(*a*) flyash kiln (*b*) coal kiln
(*c*) oil fired kiln (*d*) electrical form kiln

84. During the test of portland cement for *"loss on ignition"* the sample is heated to
(*a*) 800°C (*b*) 1000°C
(*c*) 1200°C (*d*) 1500°C

85. When water is added to cement
(*a*) heat is generated
(*b*) heat is absorbed
(*c*) chemical reaction is started
(*d*) impurities are washed out

86. The aggregate having moisture in pores and dry surface is known as
(*a*) moist aggregate
(*b*) dry aggregate
(*c*) saturated surface dry aggregate
(*d*) None of the above

87. The heat generated with the setting and hardening of cement is called
(*a*) Heat of hydration (*b*) Heat of vaporisation
(*c*) Heat of humidity (*d*) Latent heat

88. The heat of hydration of cement can be reduced by
(*a*) reducing the proportion of C_3A and C_3S
(*b*) increasing the proportion of C_3A and C_3S
(*c*) increasing the fineness of cement
(*d*) Both (*a*) and (*b*)

89. Setting time of cement increases by adding
(*a*) gypsum
(*b*) calcuim chloride
(*c*) calcium sulphate
(*d*) None of the above

90. A warehouse set cement is
(*a*) cement which absorbs moisture in warehouse
(*b*) cement which gets compressed due to load of several bags of cement above it
(*c*) cement which sets due to being adjacent to wall
(*d*) There is no such setting

91. The main component of puzzolana is
(*a*) Siliceous
(*b*) Calcium chloride
(*c*) Dicalcium silicate
(*d*) Tricalcium silicate

92. The addition of puzzolana to cement causes
(*a*) increased curing time
(*b*) less heat of hydration
(*c*) reduced permeability
(*d*) All of the above

93. The addition of puzzolana to ordinary cement may cause
(*a*) increase in early strength
(*b*) decrease in early strength
(*c*) decrease in early curing time
(*d*) increase in permeability

94. The material containing puzzolanic property is
(*a*) Shales
(*b*) Fly ash
(*c*) Diatomaceous clay
(*d*) All of the above

95. The material containing puzzolanic property is
(*a*) Pumicite (*b*) Lime
(*c*) Sandstone (*d*) Dolomite

96. The limit of *"loss on ignition"* for ordinary portland cement is
(*a*) 4% (*b*) 5%
(*c*) 6% (*d*) 7%

97. The aerated cement is produced by the addition of
(*a*) sodium silicate (*b*) powdered aluminium
(*c*) copper sulphate (*d*) None of these

98. For quality control of portland cement, the test essentially done is
(*a*) setting time
(*b*) tensile strength
(*c*) soundness and consistency
(*d*) All of the above

99. Bulk density of aggregates does not depend on
(*a*) shape and size
(*b*) specific gravity
(*c*) grading
(*d*) size and shape of container

100. The ordinate of grading curve of an aggregate represents
(*a*) cumulative % passing through each sieve plotted on normal scale
(*b*) cumulative % passing each sieve plotted on logarithmic scale
(*c*) sieve size plotted on normal scale
(*d*) sieve size plotted on logarithmic scale

101. The flakiness of aggregate has the following effect on the strength of the concrete in which it is used
(*a*) Increased strength
(*b*) Decreased strength
(*c*) Decreased Soudness
(*d*) No effect on strength

102. The moisture content and percentage absorption of water associated with aggregates are
(*a*) same (*b*) related
(*c*) unrelated (*d*) can be related

103. During hydration the space originally occupied by water in the concrete is filled with
(*a*) lime
(*b*) calcium silicate hydrate
(*c*) C_4AF
(*d*) none of the above

104. Di-calcium silicate
(*a*) generates high heat of hydration when water is added
(*b*) is responsible for 28 days strength of concrete
(*c*) hydrates rapidly
(*d*) has resistance to chemical attack

105. The sieve number used in the fineness modulus test of cement is
(*a*) 1 (*b*) 5
(*c*) 7 (*d*) 9

106. A compaction factor of 0.85 for a cement concrete sample indicates
(*a*) low workability
(*b*) medium workability
(*c*) good workability
(*d*) very good workability

107. A concrete is said to be workable if
(*a*) its consistency is of a paste
(*b*) it can be easily mixed, placed and compacted
(*c*) bleeding and segregation is there
(*d*) laitance is formed

108. Fly ash when added to cement concrete
(*a*) requires a little more water for maintenance of slump
(*b*) lowers the 28 days strength
(*c*) reduces the permeability of concrete at later ages
(*d*) all the above

109. Water cement ratio of cement concrete is dependent of
(*a*) type of cement
(*b*) cement aggregate ratio
(*c*) entrapped air
(*d*) All of the above

110. Which one of the following does not react with cement concrete ?
(*a*) Sulphuric acid
(*b*) Vegetable oils
(*c*) Alcohol
(*d*) Sewage water

111. The behaviour of cement concrete under instantaneous loads is
(*a*) Elastic (*b*) Plastic
(*c*) Visco-elastic (*d*) Brittle

112. For making a good concrete, aggregate should be in
(*a*) saturated condition
(*b*) surface dry condition
(*c*) bone dry condition
(*d*) Any of the above

113. Low heat cement is preferred for
(*a*) slabs (*b*) columns
(*c*) dams (*d*) foundations

114. In cold weather countries cement preferred is
(*a*) Ordinary Portland cement
(*b*) Puzzolana cement
(*c*) Calcium chloride cement
(*d*) Low heat cement

115. Air permeability test of cement is conducted to find the
(*a*) unsoundness
(*b*) ignition loss
(*c*) specific gravity
(*d*) fineness

116. Water/cement ratio does not depend upon
(*a*) aggregate/cement ratio
(*b*) saturation condition of aggregate
(*c*) gel-space ratio
(*d*) both (*a*) and (*c*)

117. Strength of any water/cement ratio is a function of
(*a*) temperature at which hydration of cement takes place
(*b*) air content in case of air entrained concrete
(*c*) formation of cracks due to bleeding shrinkage
(*d*) All of the above

118. Workability of concrete is defined as
(*a*) the ease with which concrete can be compacted 100 per cent
(*b*) the property of concrete which determines the amount of useful internal work necessary to produce full compaction
(*c*) the optimum lubrication required for handling, placing, compacting and finishing
(*d*) All of the above

119. Segregation means
(*a*) separation of water from aggregates and cement
(*b*) separation of fine aggregate from coarse aggregate
(*c*) separation of cement paste from coarse aggregate
(*d*) All of the above

120. Bleeding in cement concrete can be checked by adding
(*a*) puzzolana, since it breaks the continuous water channels
(*b*) air entraining agents
(*c*) by using low alkali cement
(*d*) All of the above

121. Compressive strength of cement concrete
(*a*) increases as the specimen size in increased
(*b*) decreases as the specimen size is decreased
(*c*) increases as the specimen size is decreased
(*d*) None of the above

122. High alumina cement mixed with Portland cement is used
(*a*) when setting time is to be reduced
(*b*) for underwater constructions
(*c*) when pumping time of cement is to be reduced
(*d*) All of the above

123. Fineness of medium sand ranges between
(*a*) 1.7 to 2.1 (*b*) 2.2 to 2.5
(*c*) 2.6 to 2.9 (*d*) 2.7 to 3.2

124. Superplasticizer in cement concrete
(*a*) imparts extreme workability
(*b*) reduces amount of water to be added
(*c*) improves bonding properties
(*d*) Both (*a*) and (*b*) above

125. Gypsum is added to OPC during its manufacturing which in turn acts primarily as
(*a*) flux.
(*b*) set retarder
(*c*) ant-flash setting ingredient
(*d*) water absorbent

126. An addition of lime to cement concrete
(*a*) is required for the manufacture of cement
(*b*) increases its imperviousness
(*c*) increases workability
(*d*) All of the above

127. Admixture in ordinary concrete is
(*a*) Expoxy resin (*b*) Fly ash
(*c*) CaO (*d*) quartzite

128. Curing of concrete at high temperature results in
(*a*) increase in ultimate strength
(*b*) cracking of concrete
(*c*) decrease in ultimate strength
(*d*) early development of ultimate strength

129. Lime mortar mixing is done in
(*a*) Pug mill (*b*) Hoffmann's mill
(*c*) Pan mill (*d*) None of the above

130. The compacting factor test of cement concrete determines its
(*a*) strength
(*b*) porosity
(*c*) degree of compacting under loads
(*d*) workability

131. Consider the following statements : The effect of sea water hardened concrete is to
1. increase its strength
2. reduce its strength
3. retard its setting
4. decrease its durability

Of these statements
(*a*) 1 and 3 are correct
(*b*) 2 and 3 are correct
(*c*) 2 and 4 are correct
(*d*) 1 and 4 are correct

132. Which one is not a mortar ?
(*a*) Lime mortar
(*b*) Surki mortar
(*c*) Surki sand mortar
(*d*) Fire resistant mortar

133. The fineness modulus and the bulking of fine sand bears
(*a*) inverse relationship
(*b*) direct linear relationship
(*c*) direct exponential relationship
(*d*) no relationship

134. When cement content in cement mortar is reduced, the
(*a*) slump increases
(*b*) consistency decreases
(*c*) compressive strength decreases
(*d*) none of the above

135. The effect of shape and texture on the workability of concrete is pronounced in
(*a*) fine aggregates
(*b*) coarse aggregates
(*c*) fine and coarse aggregates
(*d*) coarse aggregates all in type only

136. Improved workability may be achieved due to
(*a*) using spherical large size particles
(*b*) using spherical small size particles
(*c*) using angular large size particles
(*d*) using flaky small size particles

EXERCISE - II

(Questions From Previous SSC CPWD Exams)

2008

1. Permissible compressive strength of M200 concrete grade is
(*a*) 100 kg/cm^2 (*b*) 150 kg/cm^2
(*c*) 200 kg/cm^2 (*d*) 250 kg/cm^2

2. The shrinkage of concrete
(*a*) Is proportional to water content in the mix
(*b*) Is proportional to cement concrete
(*c*) Increase with age of concrete
(*d*) All the above

3. The length of the straight portion of a bar beyond the end of the hook should be at least
(*a*) twice the diameter
(*b*) thrice the diameter
(*c*) four times the diameter
(*d*) seven times the diameter

4. I.S.I. has specified the full strength the full strength of concrete after
(*a*) 7 days (*b*) 14 days
(*c*) 21 days (*d*) 28 days

5. The concrete mix which causes difficulty is obtaining a smooth finish is known to possess
(*a*) Segregation (*b*) Internal fraction
(*c*) Hardness (*d*) Bleeding

6. The flaky aggregate is said to be elongated if its length is
(*a*) Equal to the mean size
(*b*) Twice the mean size
(*c*) Thrice the mean size
(*d*) Four times the mean size

7. The strength and the quality of concrete depend upon
(*a*) Grading of the aggregate
(*b*) Surface area of the aggregate
(*c*) Surface texture of the aggregate
(*d*) All the above

8. The concrete having slump of 6.5 cm is said to be
(*a*) Dry (*b*) Earth moist
(*c*) Semi plastic (*d*) Plastic

9. Separation of water or water sand cement from a freshly mixed concrete is known as
(*a*) Bleeding (*b*) Creeping
(*c*) Segregation (*d*) Flooding

10. Los angles machine is used to test the aggregate for
(*a*) Crushing strength
(*b*) Impact value
(*c*) Abrasion resistance
(*d*) Water absorption

11. Column may be made of plain concrete if their unsupported length does not exceed their least lateral diameter by
(*a*) Two times (*b*) Three times
(*c*) Four times (*d*) Five times

2009

12. For walls, columns and vertical faces of all the structural members, the form work is generally removed after
(*a*) 24 to 48 hours (*b*) 3 days
(*c*) 7 days (*d*) 14 days

13. The correct proportion of ingredients of concrete depends upon
(*a*) Bulking of sand (*b*) Water content
(*c*) Absorption (*d*) All the above

14. The ratio of various ingredients (cement, sand, aggregate) in concrete of grade M 200 is:
(*a*) 1 : 2 : 4 (*b*) 1 : 3 : 6
(*c*) 1 : 1.5 : 3 (*d*) 1 : 1 : 2

15. To prevent segregation, the maximum height for placing concrete is
(*a*) 100 cm (*b*) 125 cm
(*c*) 150 cm (*d*) 200 cm