ESP-2

PROVISIONAL ANSWER KEY

Name Of The Post Gujarat Engineering Service, Class-1 and Class-2

Advertisement No 113/2018-19

Preliminary Test Held On 04-08-2019

Que. No. 001-300(Concerned Subject)

Publish Date 09-08-2019

Last Date To Send Suggestion (S) 21-08-2019

Note:-

(1) All Suggestions are to be sent with reference to website published Question paper with Provisional Answer Key Only.

(2) All Suggestions are to be sent in the given format only.

(3) Candidate must ensure the above compliance.

(૧) ઉમેદવારે વાંધા-સૂચનો રજૂ કરવા વેબસાઇટ પર પ્રસિધ્ધ થયેલ નિયત નમૂનાનો ઉપયોગ કરવો.

(૨) ઉમેદવારોએ પોતાને પરીક્ષામાં મળેલ સીરીઝની પ્રશ્નપુસ્તિકામાં છપાયેલ પ્રશ્ન ક્રમાંક મુજબ વાંધા-સૂચનો રજૂ ન કરતા તમામ વાંધા-સૂચનો વેબસાઇટ પર પ્રસિધ્ધ થયેલ પ્રોવિઝનલ આન્સર કીના પ્રશ્ન ક્રમાંક મુજબ અને તે સંદર્ભમાં રજૂ કરવા

(૩) ઉમેદવારોએ ઉક્ત સૂચનાનું અચૂક પાલન કરવું અન્યથા વાંધા-સૂચનો અંગે કરેલ રજૂઆતો ધ્યાને લેવાશે નહી.

M

1. California Bearing Ratio method of designing flexible pavements is more accurate as it involves

   (A) characteristics of soils

   (B) traffic intensities

   (C) character of the road making materials

   (D) thickness of the pavement

2. Consider the following statements regarding pavements:

   (i) Rigid pavements have good night visibility than flexible pavements.

   (ii) It is possible to make cross cutting of the rigid pavement.

   (iii) In a flexible pavement, any deformation in the top layers is transferred to the underlaid layers; but, in rigid pavements, there is slab or beam action due to which any deformation is only in the top layer of the concrete slab.

   Which of the above statements are correct?

   (A) (i) and (ii) (B) (ii) and (iii)

   (C) (i) and (iii) (D) (i), (ii) and (iii)

3. The rate of super-elevation for a horizontal curve of radius 500 m in a national highway for a design speed of 100 kmph is :

   (A) 0.08 (B) 0.07 (C) 0.06 (D) 0.03

4. The main function of Fish plates in rail joints is to :

   (A) join two rails together

   (B) provide for any expansion or contraction

   (C) transfer the load to the ballast

   (D) join rails with sleeper

5. The distance through which the tongue rail moves laterally at the toe of the switch for movement of trains is called

   (A) flangeway clearance (B) heel divergence

   (C) throw of the switch (D) flangeway of the heel

6. For a Broad Gauge route with N+7 sleeper density, the number of sleepers per rail length is

   (A) 18 (B) 19

   (C) 20 (D) 21

7. For a sleeper density of (N+5), the number of sleepers required for constructing a broad gauge railway track of length 650 m is

   (A) 975 (B) 900

   (C) 918 (D) 880

8. Roughness index of roads is expressed as
   (A) size of the stone on the pavement
   (B) number of patches on the pavement
   (C) cumulative deformation of surface per horizontal distance
   (D) type of the road surface.

9. What is the recommended value of camber for cement concrete and high type bituminous surface?
   (A) 1 in 50 (B) 1 in 40 (C) 1 in 33 (D) 1 in 25

10. The length of a transition curve is governed by
   (A) rate of change of radial acceleration
   (B) rate of change of super-elevation
   (C) both (A) and (B)
   (D) neither (A) nor (B)

11. On Indian Railways, the maximum gradient permitted in station yards is taken as
   (A) 1 in 200 (B) 1 in 300
   (C) 1 in 400 (D) 1 in 500

12. Group index method of design of flexible pavement is
   (A) A theoretical method
   (B) An empirical method based on physical properties of sub-grade soil
   (C) An empirical method based on strength characteristics of sub-grade soil
   (D) A semi empirical method

13. In the penetration macadam construction, the bitumen is
   (A) Sprayed after the aggregates are spread and compacted
   (B) Premixed with aggregates and then spread
   (C) Sprayed before the aggregates are spread and compacted
   (D) Premixed with aggregates and then spread and compacted

14. According to Indian Road Congress, the width of carriageway is
   (i) 3.75 m for single lane
   (ii) 7.0 m for two lanes without raised kerbs
   (iii) 7.5 m for two lanes with raised kerbs
   Which of these statement(s) is/are true?
   (A) (i) and (ii) (B) (ii) and (iii)
   (C) (i) and (iii) (D) (i), (ii) and (iii)

M

15. Consider the following statements regarding vibratory rollers:

(i) Vibratory rollers are used for compacting granular soils and pavement layers with granular materials.

(ii) Vibratory rollers are used for compacting non-plastic silts and fine sands.

(iii) In vibratory rollers, compaction is effected due to both the dynamic effect of the vibratory force and also the static weight of the roller.

Which of the above statement(s) is/are correct?

(A) (i) and (ii) (B) (i) and (iii)

(C) (ii) and (iii) (D) (i) only

16. For water-bound macadam roads in localities of heavy rainfall, the recommended value of camber is

(A) 1 in 30 (B) 1 in 48 (C) 1 in 60 (D) 1 in 36

17. While designing roads, bridges and culverts which of the following load is not considered?

(A) Dead Load (B) Live Load

(C) Machine Load (D) Snow Load

18. Consider the following statements:

1. Bearings are provided in bridges to transmit the load from superstructure to the sub-structure
2. Fixed bearing allows both rotation and translation
3. The design of bearing depends upon the type of superstructure, type of supports and also on the length of support.

Which of these statement(s) is/ are true?

(A) Only 1 (B) Only 2 (C) 1 and 2 (D) 1 and 3

19. In a bridge, which are the components of an abutment?

(i) Breast Wall

(ii) Wing Wall

(iii) Back Wall

(A) Only (i) (B) (i) and (ii) (C) (ii) and (iii) (D) (i), (ii) and (iii)

20. For long span such as 800 m, which type of bridge is provided?

(A) Beam bridges (B) Cantilever bridges

(C) Truss bridges (D) Suspension bridges

21. For a given discharge, the efficiency of the sedimentation tank can be increased by

(A) increasing the depth of the tank (B) decreasing the depth of the tank

(C) increasing the length of the tank (D) increasing the breadth of the tank

22. Alum as a coagulant is found to be most effective when the pH range of water is

(A) 2 to 4 (B) 4 to 6 (C) 6 to 8 (D) 8 to 10

23. Air binding phenomenon in rapid sand filters occurs due to

(A) excessive negative head (B) mud ball formation

(C) higher turbidity of the influent water (D) lower pH of the influent water

24. The process in which the chlorination is done beyond the breakpoint is known as

(A) post chlorination (B) super chlorination

(C) breakpoint chlorination (D) hyper chlorination

25. Dissolved oxygen is measured by titrating the water sample with

(A) N/35.5 $AgNO_3$ (B) N/40 $Na_2S_2O_3$

(C) H_2SO_4 (D) N/50 EDTA

26. The purpose of a proportional weir at the effluent end of a channel type grit removal unit is to

(A) Provide easy passage of solid particles

(B) Measure the rate of flow in the channel

(C) Keep the depth of flow in the channel above a certain value

(D) Maintain constant mean velocity in the channel

27. Consider the following impurities:

(i) Hydrogen-di-Sulphide (ii) Excess alkalinity

(iii) Suspended Matter (iv) Pathogenic Bacteria

What will be the correct sequence of the removal of these impurities in a water treatment plant?

(A) (i), (ii), (iii), (iv) (B) (i), (iii), (ii), (iv)

(C) (ii), (i), (iii), (iv) (D) (iii), (ii), (iv), (i)

28. With reference to Drinking Water Quality, match the Pollutants (List-I) with their Permissible Limits in the Absence of Alternate sources (List-II)

List-I		List-II	
No.	Pollutant	No.	Limits
(i)	Chloride (as Cl)	(iv)	1000 mg/lit
(ii)	Sulphate (as SO_4)	(v)	400 mg/lit
(iii)	Total Alkalinity as $CaCO_3$	(vi)	600 mg/lit

(A) (i)-(iv), (ii)-(v), (iii)-(vi) (B) (i)-(iv), (ii)-(vi), (iii)-(v)

(C) (i)-(vi), (ii)-(v), (iii)-(iv) (D) (i)-(v), (ii)-(iv), (iii)-(vi)

M

29. As per IS 10500-2012, which of the following Pollutant(s) have some relaxation in their Acceptable Limits in the absence of alternate sources of water?

(i) Aluminium (as Al) (ii) Ammonia (as total ammonia-N)

(iii) Barium (as Ba) (iv) Boron (as B)

(A) Only (i) (B) (i) and (iv)

(C) (iii) and (iv) (D) (i) and (ii)

30. Which of the following pairs of Water Quality Parameter and Method of determination is not correctly matched?

(A) Hardness : EDTA Method

(B) Dissolved Oxygen : Winkler's Method

(C) Chlorine : Orthotolidine test

(D) Chloride : SPADNS Method

31. Which of the following is not an example of Secondary Air Pollutant?

(A) Ozone (B) Formaldehyde

(C) Acid Mist (D) Halogen Compounds

32. The full form of the secondary air pollutant PAN is

(A) Peroxy Acetyl Nitrate

(B) Peroxy Amine Nitrate

(C) Photochemical Acetyl Nitrate

(D) Photochemical Amine Nitrate

33. Which of the following plume behaviour will have the most severe implications on human health?

(A) Coning (B) Fanning

(C) Trapping (D) Fumigation

34. Which of the following air pollution control equipment is not an example of Inertial Separators?

(A) Baffle type separator (B) Louvre type separator

(C) Dust trap (D) Settling chamber

35. Ringelmann Chart is most commonly used for

(A) estimating the density of smoke

(B) estimating the direction of smoke

(C) estimating the particulate matter from automobiles

(D) estimating the flue gas velocity

36. Which of the following method is adopted for the measurement of NO_2 in air?
    (A) Chemiluminescence
    (B) Beta attenuation
    (C) Non-Dispersive Infra Red Spectroscopy
    (D) Gravimetric

37. What is the permissible 1-hourly concentration of Carbon monoxide in ecologically sensitive areas?
    (A) 2 mg/m^3 (B) 2 $\mu g/m^3$ (C) 4 mg/m^3 (D) 4 $\mu g/m^3$

38. Which of the following methods are correct for calculating the annual average concentration of a criteria air pollutant?
    (A) Arithmetic mean of minimum 104 sampling points in a given area sampled for 24 hours once in a year
    (B) Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week for 24 hourly sampling at uniform intervals
    (C) Arithmetic mean of minimum 208 measurements in a year at a particular site taken four times a week for 24 hourly sampling at uniform intervals
    (D) Arithmetic mean of 365 measurements in a year at a particular site for 24 hourly sampling

39. Central Pollution Control Board recently labelled which five chemicals as toxic in the manufacturing of crackers and thereby prohibited their respective use?
    (A) Antimony, Lithium, Mercury, Arsenic and Lead
    (B) Antimony, Lithium, Chromium, Lead and Nickel
    (C) Cadmium, Lead, Nickel, Zinc and Iron
    (D) Beryllium, Cadmium, Mercury, Chromium and Nickel

40. Arrange the following Greenhouse gases in the increasing order of their Global Warming Potential:
    (A) Methane < Nitrous Oxide < Hydrochloroflurocarbon-22 < Sulphur hexafluoride
    (B) Nitrous Oxide < Methane < Hydrochloroflurocarbon-22 < Sulphur hexafluoride
    (C) Methane < Nitrous Oxide < Sulphur hexafluoride < Hydrochloroflurocarbon-22
    (D) Methane < Hydrochloroflurocarbon-22 < Nitrous Oxide < Sulphur hexafluoride

41. Which of the following is responsible for the overall monitoring of the implementation of the Solid Waste Management Rules, 2016 in India?
    (A) Ministry of Environment, Forest and Climate Change
    (B) Ministry of Urban Development
    (C) Central Pollution Control Board
    (D) Niti Aayog

M

42. In order to prevent pollution from landfill operation which of the following provisions are supposed to be made?

(i) The storm water drain shall be designed and constructed in such a way that the surface runoff water is diverted from the landfilling site and leachates from solid waste locations do not get mixed with the surface runoff water

(ii) Non-permeable lining system should be provided at the base and walls of waste disposal area.

(iii) Provisions for management of leachates including its collection and treatment shall be made.

(A) Only (i) (B) Only (ii) (C) (i) and (ii) (D) (i), (ii) and (iii)

43. As per the Solid Waste Management Rules, 2016, the landfill site shall be

(i) 100 meter away from river.

(ii) 200 meter away from a pond.

(iii) 200 meter away from Highways, Habitations, Public Parks and water supply wells.

(iv) 20 km away from Airports or Airbase.

(A) (i) and (ii) (B) (i) and (iii)

(C) (i), (ii) and (iii) (D) (i), (ii), (iii) and (iv)

44. Before establishing any landfill site, baseline data of ground water quality in the area shall be collected and kept in record for future reference. The ground water quality within _____ of the periphery of landfill site shall be periodically monitored covering different seasons in a year

(A) 50 meters (B) 100 meters

(C) 500 meters (D) 1000 meters

45. Ambient Air Quality at the landfill site shall meet the standards prescribed by Central Pollution Control Board for

(A) Residential Area (B) Industrial Area

(C) Commercial Area (D) Ecologically sensitive area

46. The post-closure care of landfill site shall be conducted for at least

(A) 5 years (B) 10 years (C) 15 years (D) 20 years

47. A coastal city produces Municipal Solid Waste (MSW) with high moisture content, high organic materials, low calorific value and low inorganic materials. The most effective and sustainable option for MSW management in that city is

(A) Composting (B) Incineration

(C) Landfill (D) Dumping in sea

48. The maximum C/N ratio in a Municipal Solid Waste Compost is

(A) 10:1 (B) 20:1 (C) 30:1 (D) 40:1

49. For estimating the bulk density of Municipal Solid Waste compost, the compost sample should be

(A) dried in a hot air oven at 70°C for 24 hours

(B) dried in a hot air oven at 70°C for 12 hours

(C) dried in a hot air oven at 103°C for 24 hours

(D) dried in a hot air oven at 103°C for 12 hours

50. As per Construction and Demolition Waste Management Rules, 2016, Waste generators who generate more than _____ per project in a month shall segregate the waste into various streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work

(A) 100 tons (B) 200 tons

(C) 300 tons (D) 400 tons

51. An area comprising not less than _____ metres around hospitals, educational institutions and courts may be declared as silence area / zone.

(A) 50 (B) 100 (C) 250 (D) 500

52. As per the Noise Pollution (Regulation and Control) Amendment Rules, 2017, the State Government may permit use of loud speakers or public address systems and the like during night hours (between 10.00 p.m. and 12.00 midnight) on or during any cultural, religious or festive occasion of a limited duration not exceeding _____ days in all during a calendar year

(A) 10 (B) 15 (C) 20 (D) 25

53. The State Governments have categorized the areas into how many types or zones for the purpose of implementation of noise standards?

(A) 3 (B) 4 (C) 5 (D) 6

54. For a residential area, the permissible L_{eq} (time weighted average of the level of sound in decibels on scale A during the night time) is

(A) 35 (B) 45 (C) 55 (D) 65

55. The reference pressure used in the determination of sound/pressure level is

(A) 10μPa (B) 10 dB (C) 20μPa (D) 20 dB

56. Under ideal conditions, the COD/TOC ratio for sewage containing only organic matter is

(A) 2.66 (B) 0.375 (C) 1.66 (D) 0.5

57. In a sludge digestion tank, if the moisture content of sludge is reduced from 90% to 80% then the percentage decrease in the volume of sludge is

(A) 5% (B) 10% (C) 25% (D) 50%

58. As per CPHEEO manual, the minimum velocity at initial peak flow and ultimate peak flow in a sewer should not be less than,

(A) 0.3 m/s and 0.6 m/s
(B) 0.6 m/s and 0.8 m/s
(C) 0.6 m/s and 1.2 m/s
(D) 1.2 m/s and 3 m/s

59. For drainage pipes in buildings, the test applied before putting them to use is

(A) smoke test
(B) water test
(C) straightness test
(D) All of the above

60. Which of the following pump is used to pump sewage solids with liquid sewage without clogging the pump?

(A) Jet pump
(B) Centrifugal pump
(C) Pneumatic ejector
(D) Reciprocating pump

61. The sewer which resists sulphide corrosion is

(A) Lead sewer
(B) Cast iron sewer
(C) RCC Sewer
(D) Brick sewer

62. A well oxidized sewage contains nitrogen mainly as

(A) Nitrites
(B) Nitrates
(C) Free ammonia
(D) Ammoniacal Nitrogen

63. For detecting the nitrates in sewage, the colour may be developed by adding

(A) Magnesium sulphate and potassium hydroxide
(B) Phenol-di-sulphuric acid and potassium hydroxide
(C) Vanadium-pentoxide and magnesium sulphate
(D) Sulphuric acid and napthamine

64. The maximum spacing of manholes specified as per Indian Standards in sewers upto 0.3 m diameter is

(A) 75 m (B) 60 m (C) 45 m (D) 30 m

65. When wastewater is disposed off into a running stream, 4 zones are formed. In which of the following zones will the minimum level of dissolved oxygen be found?

(A) Zone of degradation
(B) Zone of active decomposition
(C) Zone of recovery
(D) Zone of clear water

66. A scale of 1 cm = 3 km is represented as a Representative Fraction as

(A) 1 : 3000
(B) 1 : 30000
(C) 1 : 300000
(D) 1 : 3000000

67. A diagonal scale is used for measuring
    (A) Units and one-tenths of units
    (B) Units, tenths and hundredths of units
    (C) Diagonals of a closed polygons
    (D) Angles between lines in plan

68. A vernier is made using a main scale of one meter to read mm. If the vernier scale is divided into cm divisions, the vernier will have
    (A) 10 divisions for 9 main scale divisions
    (B) 11 divisions for 10 main scale divisions
    (C) 20 divisions for 19 main scale divisions
    (D) 21 divisions for 20 main scale divisions

69. If the actual length of a 20 m chain is found to be 19.8 m, then the actual length of a line measured as 100 m with that chain will be
    (A) 98 m (B) 99 m
    (C) 101 m (D) 102 m

70. Correction due to sag of a tape is
    (A) always positive
    (B) always negative
    (C) sometimes negative and sometimes positive
    (D) dependent on the temperature conditions

71. In an optical square, the two mirrors are placed at an angle of
    (A) 30° (B) 45° (C) 60° (D) 90°

72. If the whole circle bearing of side AB of an equilateral triangle ABC is 38°45', then the bearing of the third side CA of the triangle is
    (A) 278°45' (B) 197°30'
    (C) 98°45' (D) 81°15'

73. Magnetic declination is
    (A) the deflection of magnetic needle due to external magnetic sources
    (B) the error in the bearings due to external magnetic influences
    (C) the angle between the true meridian and the magnetic meridian at a place
    (D) the dip of the needle to the earth's magnetic field

74. Magnetic bearing of a line is found as 35°45'. If the declination is 3°45' E, then the true bearing is
    (A) 32°00' (B) 39°30' (C) 35°45' (D) 3°45'

75. The horizontal circle in a theodolite is graduated in
    (A) the quadrantal system from 0 to 90 in the four quadrants
    (B) the whole circle system from 0 to 360
    (C) the semi-circle system from 0 to 180 in the right and left halves
    (D) a way similar to that in a prismatic compass

76. The two-point problem in plane tabling is essentially a problem of
    (A) orienting the plane table
    (B) centering the table
    (C) finding the line joining the two points
    (D) solving a triangle

77. The three-point problem in plane tabling involves
    (A) determining the position of three points
    (B) locating the station occupied by plane table given the position of the three points
    (C) locating the position of two points given the position of the third point
    (D) surveying a triangular area

78. When the reading was taken on a staff held at a point of known elevation of 123.45 m, the staff reading was recorded as 1.875 m. The height of the instrument would be
    (A) 1.875 m
    (B) 121.575 m
    (C) 123.45 m
    (D) 125.325 m

79. When you have to cross a water body while performing levelling operations, then the best method is
    (A) Fly levelling
    (B) Trigonometric levelling
    (C) Reciprocal levelling
    (D) Differential levelling

80. Hypsometry is a method of
    (A) surveying of water bodies
    (B) determining elevations based on the boiling point of liquids
    (C) determining elevations based on the atmospheric pressure
    (D) finding temperatures at different heights

81. In the planimeter formula for measuring area, $A = M(FR - IR \pm 10\ N) + C$, the additive constant is considered when
    (A) the anchor point is inside the area being measured
    (B) the anchor point is outside the area being measured
    (C) the area traced is in clockwise direction
    (D) the area traced is in anti-clockwise direction

82. The difference between contouring and levelling is that

(A) contouring focuses on distance measurements while levelling focuses on elevation

(B) contouring is an angle measuring operation while levelling is for measuring heights

(C) contouring focuses on finding points having a given elevation while levelling is to find the elevation of given points

(D) contouring focuses on finding points having a given elevation while levelling is to find the elevation of points having same contour interval

83. Stadia tacheometry is based on the principle that

(A) trigonometrical formulae can be used to calculate distances from vertical angles

(B) intercepts on measuring rods are proportional to the distance

(C) horizontal distances vary linearly as vertical angles

(D) knowing the side and two angles of a triangle, another side can be calculated

84. The multiplying constant in the distance formula by tacheometry is given by

(A) focal length of the objective lens divided by the distance between the stadia wires

(B) focal length of the objective lens multiplied by the distance between the stadia wires

(C) stadia intercept divided by the focal length of the objective lens

(D) stadia intercept multiplied by the focal length of the objective lens

85. In using the two-theodolite method for setting curves, the principle used is

(A) deflection angle is equal to the tangential angle for any chord to the point

(B) angle of intersection is the same as the angle subtended at the centre

(C) deflection to any point P from the first tangent is the same as the angle between the long chord and the direction to P from the second tangent point

(D) equal chords subtend equal angles at the centre

86. The property of a mineral by virtue of which it can be cut with a knife is

(A) Parting (B) Sectile (C) Malleable (D) Ductile

87. Stratification can be seen widely in which of the following rocks?

(A) Igneous rocks (B) Metamorphic rocks

(C) Sedimentary rocks (D) Fossil rocks

88. Metamorphic rocks are the rocks which are formed

(A) when molten lava (magma) cools and turns to solid rock

(B) when heat and pressure are applied on the rocks

(C) when small pieces of rocks are pressed together over a period of time

(D) due to the gradual erosion of the earth surface

M

89. Mafic rocks are a part of
(A) Igneous rocks (B) Sedimentary rocks
(C) Metamorphic rocks (D) Fossil rocks

90. The magnitude of an earthquake is based on what aspect of the seismic wave?
(A) Amplitude (B) Frequency
(C) Time period (D) Intensity

91. When the plastic limit of a soil is greater than the liquid limit, then the plasticity index is reported as
(A) Negative (B) Zero
(C) Non-plastic (D) 1

92. Toughness Index is defined as the ratio of
(A) Plasticity Index to Consistency Index
(B) Plasticity Index to Flow Index
(C) Liquidity Index to Flow Index
(D) Consistency Index to Liquidity Index

93. If the Consistency Index of soil is in the range of 50-75% then the soil is said to be
(A) Soft (B) Medium (C) Stiff (D) Hard

94. Sensitivity of a soil is defined as the ratio of the
(A) undisturbed strength to the remoulded strength at same water content
(B) undisturbed strength to the remoulded strength at 100% moisture content
(C) remoulded strength to the undisturbed strength at same water content
(D) remoulded strength to undisturbed strength at 100% moisture content

95. Inorganic Silts with low plasticity is represented by
(A) MH (B) SL (C) ML (D) CH

96. Seepage velocity of water in soil is equal to the
(A) discharge velocity divided by porosity
(B) discharge velocity multiplied by porosity
(C) discharge velocity divided by permeability
(D) discharge velocity multiplied by permeability

97. Which are the factors that affect the permeability of soil?
(i) Particle size (ii) Void ratio
(iii) Degree of saturation (iv) Adsorbed water
(A) (i) and (ii) (B) (i), (ii) and (iii)
(C) (ii) and (iv) (D) (i), (ii), (iii) and (iv)

98. Which are the corrections applied to the hydrometer readings?

(i) Meniscus correction
(ii) Temperature correction
(iii) Density correction
(iv) Dispersing agent correction

(A) (i) and (ii)
(B) (i), (ii) and (iii)
(C) (i), (ii) and (iv)
(D) (i), (ii), (iii) and (iv)

99. Which of the following are the uses of a Particle Size Distribution Curve for a coarse grained soils?

(i) For approximately assessing the coefficient of permeability
(ii) For approximately judging the compressibility of soil
(iii) To assess the susceptibility of soil to frost action
(iv) For assessing the mode of deposition of soil

(A) (i) and (ii)
(B) (i), (ii) and (iii)
(C) (i), (ii) and (iv)
(D) (i), (ii), (iii) and (iv)

100. If the ratio of the plasticity index and the percentage of clay fraction finer than 2μ is 2, then the soil is classified as

(A) Inactive (B) Normal (C) Active (D) Hyperactive

101. Shear strength of a soil is its

(A) minimum resistance to shear stresses just before the failure
(B) minimum resistance to shear stresses just after the failure
(C) maximum resistance to shear stresses just before the failure
(D) maximum resistance to shear stresses just after the failure

102. In a Mohr circle, the shear stress τ_f on the plane of maximum obliquity is

(A) less than the maximum shear stress τ_{max}
(B) more than the maximum shear stress τ_{max}
(C) equal to the maximum shear stress τ_{max}
(D) numerically equal to $(\sigma_1 - \sigma_3) / 2$

103. Which of the following test is not used to measure the shear strength of a soil?

(A) Triaxial Compression Test
(B) Standard Procter Test
(C) Unconfined Compression Test
(D) Shear Vane Test

104. Coefficient of consolidation for clays normally

(A) decreases with increase in liquid limit
(B) increases with increase in liquid limit
(C) first increases then decreases with increase in the liquid limit
(D) remains constant at all liquid limits

105. The time factor T_v for a clay layer does not depend on

(A) Coefficient of consolidation (B) Time

(C) Compressibility index (D) Drainage path

106. The factor of safety against sliding of structures which resist lateral forces (such as retaining walls) shall be not less than _____when dead load, live load and earth pressure only are considered

(A) 1.50 (B) 1.75 (C) 2.00 (D) 2.25

107. With respect to the site investigation for a foundation, significant depth is defined as

(A) the depth upto which the stress increment due to superimposed load can produce significant settlement

(B) the depth at which the ground water is encountered

(C) the depth at which a rock strata is obtained

(D) the depth at which coefficient of consolidation equals coefficient of compressibility

108. The coefficient of active earth pressure for a loose sand having an angle of internal friction of 30° is

(A) 1/3 (B) 3 (C) 1 (D) 1/2

109. Coefficient of earth pressure at rest is

(A) Less than coefficient of active earth pressure but greater than coefficient of passive earth pressure

(B) Greater than coefficient of active earth pressure but less than coefficient of passive earth pressure

(C) Less than both coefficient of active earth pressure and coefficient of passive earth pressure

(D) Greater than both coefficient of active earth pressure and coefficient of passive earth pressure

110. For multi-storeyed buildings having isolated foundations on sand, the maximum permissible settlement is

(A) 50 mm (B) 60 mm (C) 75 mm (D) 100 mm

111. The factor of safety for shallow foundation against overturning shall be not less than _____ when dead load, live load and earth pressures are considered together with wind load or seismic forces.

(A) 1.5 (B) 2.0 (C) 2.5 (D) 3.0

112. Terzaghi's bearing capacity factors namely N_c, N_q, N_γ are functions of

(A) Shape of the foundation (B) Size of the foundation

(C) Angle of shearing resistance (D) Cohesion

113. As per IS 1904-1986, all foundations shall extend to a depth of at least _____ below natural ground level

(A) 500 mm (B) 1000 mm

(C) 1500 mm (D) 2000 mm

114. Lime stabilization is very effective in treating

(A) sandy soils (B) silty soils

(C) non-plastic soils (D) plastic clayey soils

115. Which one of the following gives the correct decreasing order of the densities of a soil sample?

(A) Saturated, Submerged, Wet, Dry (B) Submerged, Saturated, Dry, Wet

(C) Saturated, Wet, Dry, Submerged (D) Saturated, Dry, Wet, Submerged

116. Auger boring is suited for which of the following exploratory strata?

(A) Partly saturated sands, silts and medium to stiff cohesive soils

(B) All types of soils and rocks except fissured rocks

(C) Practically all types of soils except hard and cemented soil or rock

(D) All types of soils and rocks except loose sands and soft sticky clays

117. Batter Piles are designed to carry which type of load?

(A) Uplift Load

(B) Lateral Load

(C) Load due to negative skin friction

(D) Buckling load

118. In the Standard Penetration Test, the split spoon sampler is penetrated into soil stratum by giving blows from a drop weight whose weight (in Kg) and free fall (in cm) are respectively

(A) 65 and 75 (B) 75 and 65

(C) 65 and 30 (D) 30 and 65

119. The net ultimate bearing capacity of a purely cohesive soil

(A) depends on the width of the footing and is independent of the depth of the footing

(B) depends on the width as well as the depth of the footing

(C) depends on the depth but is independent of the width of the footing

(D) is independent of both the width and depth of the footing

120. As per IS:2911 (Part 1), the minimum centre to centre spacing of friction piles of diameter D is

(A) 1.5 D (B) 2.0 D

(C) 2.5 D (D) 3.0 D

M

121. Free float is mainly used to

(A) identify the activities which can be delayed without affecting the total float of the preceding activity

(B) identify the activities which can be delayed without affecting the total float of the succeeding activity

(C) identify the activities which can be delayed without affecting the total time of the project

(D) identify the activities which can be delayed without affecting the total profit of the project

122. The time with which direct cost does not reduce with the increase in time is known as

(A) Crash time (B) Optimistic time

(C) Normal time (D) Standard time

123. 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 minimum for critical events

124. For the task of estimating and costing, doors and windows are computed in

(A) Running meter (B) Square meter

(C) Cubic meter (D) Numbers

125. Which of the following method of valuation is most suitable for hotel and cinemas?

(A) Rental method (B) Direct comparison

(C) Valuation based on profit (D) Valuation based on cost

126. If there are n number of events in the networks diagram then number of dual role event will be

(A) n-1 (B) n+1 (C) n-2 (D) n+2

127. The system of organization introduced by F.W. Taylor is known as

(A) Effective Organization (B) Functional Organization

(C) Line Organization (D) Line and Staff Organization

128. Sensitivity analysis is a study of

(A) Comparison of profit and loss

(B) Comparison of assets and liabilities

(C) Change in output due to change in input

(D) Economics of cost and benefits of the project.

129. Consider the following rules of network diagram and state which of them are correct:

(i) Network always have single initial and final event.

(ii) An event can occur twice.

(iii) No activity can start until its tail end event has occurred.

(iv) It is usual practice to show time flow from right to left.

(A) (i), (ii) and (iii) (B) (i) and (iii)

(C) (i), (iii) and (iv) (D) (i), (ii), (iii) and (iv)

130. Which of the following data(s) is/are required for updating of plan at intermediate stage of execution of project?

(i) Original network with calculation chart

(ii) Point or date of updating

(iii) New information and knowledge which will affect the duration time of the activities to be performed.

(A) (i) and (ii) (B) (i) and (iii) (C) Only (iii) (D) (i), (ii) and (iii)

131. If the excavation of the earth is done manually then it costs Rs 10 per cum. A machine can excavate at fixed cost of Rs 4000 plus a variable cost of Rs 2 per cum. The quantity of earth for which the cost of excavation by machine will be equal to the cost of manual excavation is

(A) 500 cum. (B) 1000 cum. (C) 1500 cum. (D) 2000 cum.

132. All the tenders received may be rejected if

(i) The lowest tenderer has quoted a figure, which is higher than the funds available for the execution of the work

(ii) Radical changes in design are found necessary during the interval preceding the opening of the tenders

(iii) The minimum number of tenders to assure adequate competition has not been received.

(iv) There exists a well-grounded suspicious collusion between tenderers or some other form of the fraud has been detected.

Which of the following statements are correct?

(A) (i) and (ii) (B) (iii) and (iv)

(C) (i), (ii) and (iii) (D) (i), (ii), (iii) and (iv)

133. Which of the following contracts is not type of cost plus contract?

(A) Cost plus percentage contract

(B) Cost plus lump sum contract

(C) Cost plus fixed fee contract

(D) Cost plus fluctuating fee contract

M

134. Which of the following is considered as Outgoings in expenses?

(i) Repairs

(ii) Sinking fund

(iii) Loss of rent

(A) (i) and (ii) (B) (ii) and (iii)

(C) (i) and (iii) (D) (i), (ii) and (iii)

135. Productivity performance variance is equal to

(A) $\frac{\text{Actual Productivity}}{\text{Planned Productivity}}$

(B) $\frac{\text{Planned Productivity}}{\text{Actual Productivity}}$

(C) Planned productivity minus actual productivity

(D) Actual productivity minus planned productivity

136. An ideal fluid is one which is

(A) non-viscous

(B) incompressible

(C) incompressible and non-viscous

(D) non-viscous and frictionless

137. According to Newton's law of viscosity, shear stress is

(A) directly proportional to the velocity

(B) inversely proportional to the velocity

(C) directly proportional to the velocity gradient

(D) directly proportional to viscosity

138. The magnitude of water hammer is dependent on

(i) the length of the pipe line

(ii) the elastic properties of the fluid passing through the pipe

(iii) the speed at which the valve is closed

(A) Only (i) (B) (i) and (ii)

(C) (ii) and (iii) (D) (i), (ii) and (iii)

139. The most economical section of a rectangular section is one which has hydraulic radius equal to

(A) one-third the depth of flow (B) half the depth of flow

(C) two-third the depth of flow (D) depth of flow

140. The point about which a floating body starts oscillating when the body is tilted is called:

(A) centre of buoyancy
(B) centre of gravity
(C) centre of pressure
(D) metacentre

141. For a submerged body, if the centre of buoyancy is above the centre of gravity, the equilibrium is called as

(A) stable equilibrium
(B) unstable equilibrium
(C) neutral equilibrium
(D) restoring equilibrium

142. If the velocity, pressure and density do not change at a point with respect to time, the flow is called

(A) Uniform flow
(B) Eulerian flow
(C) Lagrangian flow
(D) Steady flow

143. Bernoulli's equation can be derived from the principle of

(A) Conservation of Mass
(B) Conservation of Energy
(C) Conservation of Momentum
(D) Conservation of Pressure

144. In steady laminar flow of a liquid through a circular pipe of internal diameter D carrying a constant discharge, the hydraulic gradient will be

(A) proportional to D^2
(B) proportional to D^3
(C) inversely proportional to D^2
(D) inversely proportional to D^3

145. Stoke's law deals with

(A) settling of fine particles
(B) turbulent flow between the parallel plates
(C) laminar flow between the parallel plates
(D) laminar flow in the tubes

146. In a pipe network

(A) the algebraic sum of discharges around each elementary circuit must be zero
(B) the algebraic sum of the drop in piezometric head around each elementary circuit should be zero
(C) the head at each node must be same
(D) the piezometric head loss in each line of each circuit should be same

147. In model similarity, if gravitational and inertia forces are the only important forces, then what is the discharge ratio (Note : L_r is the ratio of length dimension)?

(A) $L_r^{3/2}$
(B) $L_r^{1/2}$
(C) $L_r^{5/2}$
(D) $L_r^{1/3}$

148. The performance of a hydraulic structure during a flood has been investigated in a 1/36 model based on Froude law of similarity. A flood wave passing through the model in 3 hours corresponds to the prototype period of

(A) 3 hours
(B) 9 hours
(C) 18 hours
(D) 36 hours

149. If the Froude number of a hydraulic jump is 2.0, the jump can be classified as

(A) Undular jump
(B) Weak Jump
(C) Oscillating jump
(D) Steady jump

150. Hygrometer is used for estimating

(A) water vapour content of air
(B) water content of soil
(C) capillary potential of soil water
(D) specific gravity of a liquid

151. The overall efficiency of a turbine is the ratio of the

(A) power developed by the runner of a turbine to the power supplied by the water at the inlet of the turbine
(B) power at the shaft of the turbine to the power developed by the runner
(C) volume of water actually striking the runner to the volume of water supplied to the turbine
(D) power available at the shaft of the turbine to the power supplied by the water at the inlet of the turbine

152. Which of the following statement(s) is/are incorrect?

(i) A turbine is called impulse turbine if at the inlet of the turbine total energy is only kinetic energy
(ii) A turbine is called reaction turbine if at the inlet of the turbine the total energy is kinetic energy and pressure energy
(iii) The inward flow reaction turbine having radial discharge at outlet is known as Kaplan turbine

(A) Only (i)
(B) Only (iii)
(C) (i) and (ii)
(D) (ii) and (iii)

153. The specific speed for a turbine is the speed of a geometrically similar turbine which would

(A) produce unit power (one kilowatt) under unit head (one meter).
(B) produce unit discharge (1 litre/sec) under unit head (one meter)
(C) produce unit discharge (1 litre/sec) with unit power (one kilowatt)
(D) produce unit head (one meter) with unit power (one kilowatt)

154. Governing of a turbine means

(A) the head is kept constant under all conditions of working

(B) the speed is kept constant under all conditions of working

(C) the discharge is kept constant under all conditions of working

(D) the frictional loss is kept constant under all conditions of working

155. Which of the following pump is suitable for small discharge and high head?

(A) Centrifugal pump (B) Reciprocating pump

(C) Mixed flow pump (D) Axial flow pump

156. A plot between rainfall-intensity versus time is called

(A) Isohyet (B) Mass curve

(C) Hyetograph (D) Hydrograph

157. The instrument used for measuring evaporation is:

(A) hygrometer (B) atmometer

(C) lysimeter (D) luxmeter

158. Time of concentration is the

(A) time of maximum possible precipitation that may concentrate and fall over a given basin.

(B) time taken by the rain water to flow to an existing defined drain in a basin.

(C) time for which the rain water remains concentrated on the basin.

(D) maximum time taken by the rain water to reach the outlet of the basin.

159. The earthen embankments constructed parallel to the river at some suitable distances for flood protection are called

(A) Guide banks (B) Levees

(C) Terraces (D) Groynes

160. The evaporation losses from the surface of a reservoir can be reduced by sprinkling

(A) Cetyl alcohol (B) Methyl alcohol

(C) Chlorine (D) Alum

161. Which of the following is a non-recording rain gauge?

(A) Tipping bucket type rain gauge

(B) Simon's rain gauge

(C) Floating type rain gauge

(D) Weighing type rain gauge

M

162. Tortuosity of a meandering river is

(A) the ratio of curved length along the channel to the direct axial length of the river reach

(B) the ratio of direct axial length of the river reach to the curved length along the channel

(C) the difference of curved length along the channel and the direct axial length of the river reach

(D) the summation of curved length along the channel and the direct axial length of the river reach

163. As per Indian Standards, in predominantly hilly areas with heavy rainfall, there should be 1 rain gauge station per _____ km^2

(A) 520 (B) 330

(C) 130 (D) 30

164. Permanent wilting point is

(A) a characteristic of the plant

(B) a soil characteristic

(C) a soil characteristic modified by rainfall intensity

(D) a soil characteristic modified by solar intensity

165. Specific storage refers to

(A) volume of water stored in the unit volume of aquifer

(B) water that a portion of an aquifer releases from storage, per unit mass or volume of aquifer, per unit change in hydraulic head, while remaining fully saturated.

(C) volume of water drained by gravity per unit volume of aquifer

(D) the difference between field capacity and evapotranspiration

166. Which of the following statement(s) is/are correct?

(i) Normal ratio method is used for estimating missing annual precipitation value at a station when the annual precipitation and normal annual precipitation at neighbouring stations are known

(ii) arithmetic average method of calculating the average precipitation is superior to Thiessen-Polygon method

(iii) Isohyetal method of calculating average rainfall is superior to arithmetic average method and Thiessen-Polygon method

(A) (i) and (ii) (B) (i) and (iii)

(C) (ii) and (iii) (D) (i), (ii) and (iii)

167. Depth-Area-Duration curves of precipitation are drawn as

(A) Minimizing envelopes through the appropriate data points

(B) Maximizing envelopes through the appropriate data points

(C) Best fit curves through the appropriate data points

(D) Best fit mean straight lines through the appropriate data points

168. The Bowen ratio is defined as

(A) Ratio of heat flux to moisture flux near the surface

(B) Proportionality constant between vapour heat flux and sensible heat flux

(C) Ratio of actual evapotranspiration and potential evapotranspiration

(D) Proportionality constant between heat energy used up in evaporation and the bulk radiation from a water body.

169. A 3-hour storm hydrograph has 7 units of direct runoff. The 3-hour unit hydrograph for this storm can be obtained by dividing the ordinates of the storm hydrograph by

(A) 3 (B) 7

(C) 3/7 (D) 7/3

170. A unit hydrograph for a watershed is triangular in share with base period of 20 hours. The area of watershed is 500 ha What is the peak discharge in m^3/hr?

(A) 4000 (B) 5000

(C) 6000 (D) 7000

171. Consumptive Irrigation Requirement is calculated using the following:

(i) Consumptive use

(ii) Effective rainfall

(iii) Water lost as percolation

(A) Only (i) (B) (i) and (ii)

(C) (i) and (iii) (D) (i), (ii) and (iii)

172. If the Sodium Adsorption Ratio of the irrigation water is 11, then it is classified as

(A) Low sodium water (B) Medium Sodium Water

(C) High Sodium Water (D) Very High sodium water

173. A shallow well is a well

(A) whose depth is less than its width

(B) whose depth is less than 20 feet

(C) which does not rest on a mota formation

(D) which rests on a mota formation

M

174. Critical Velocity Ratio is defined as the

(A) Ratio of actual mean velocity (V) to the critical velocity (V_o) given by Kennedy formula

(B) Ratio of critical velocity (V_o) given by Kennedy formula to the actual mean velocity (V)

(C) Ratio of actual mean velocity (V) to the critical velocity (V_o) given by Lacey formula

(D) Ratio of critical velocity (V_o) given by Lacey formula to the actual mean velocity (V)

175. Wetted perimeter of an unlined canal as per Lacey is given by

(A) $4.75\ Q^{0.5}$ (B) $5.75\ Q^{0.5}$

(C) $4.75\ Q^{0.75}$ (D) $5.75\ Q^{0.75}$

176. Paleo is defined as

(A) the first watering before the crop is sown

(B) the first watering after the crop is sown

(C) the first watering after the application of fertilizers

(D) the last watering before the harvest

177. Which of the following is not true pertaining to the Rational method for determining the peak discharge from drainage basin runoff?

(A) Runoff coefficient is multiplied with the intensity of rainfall

(B) Runoff coefficient is multiplied with the drainage area

(C) Drainage area is multiplied with the intensity of rainfall

(D) Intensity of rainfall is multiplied with runoff

178. A 4-hr storm had 4 cm of rainfall and the resulting direct runoff was 2.0 cm. If the ϕ-index remains at the same value, the runoff due to 10 cm of rainfall in 8 hour in the catchment will be

(A) 4.0 cm (B) 6.0 cm

(C) 7.5 cm (D) 8.0 cm

179. The probability of a 10-year flood to occur at least once in next 2 years is

(A) 9% (B) 19%

(C) 29% (D) 39%

180. The design flood commonly adopted in India for barrages and minor dams is

(A) Probable Maximum Flood

(B) a flood of 50-100 years return period

(C) Peak Flood

(D) Standard Project Flood or a 100-year flood (whichever is higher)

181. According to the maximum shear stress failure criterion, yielding in material occurs when
(A) Maximum shear stress = yield stress
(B) Maximum shear stress = half of yield stress
(C) Maximum shear stress = 2 × yield stress
(D) Maximum shear stress just exceeds the yield stress

182. Assertion (A): Normal stress of one nature (compressive or tensile) acting along one of the three orthogonal axes of a member will produce strains of the same nature in its direction and strains of opposite nature along the other two directions.

Reason (R): Sum of the strains along the three orthogonal axes equals volumetric strains.

Of these statements:
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true

183. The radius of Mohr's circle is zero when the state of stress is such that
(A) Shear stress is zero
(B) There is pure shear
(C) There is no shear stress but identical direct stresses in two mutually perpendicular directions
(D) There is no shear stress but equal direct stresses, opposite in nature, in two mutually perpendicular directions.

184. The state of two dimensional stress acting on a concrete lamina consists of a direct tensile stress of 6 MPa and shear stress of 4 MPa, which cause cracking of concrete. Then the tensile strength of the concrete in MPa is
(A) 6 MPa (B) 8 MPa (C) 10 MPa (D) 12 MPa

185. In combined stress theory, kern of a section is that area of the cross-section whereupon loading there will be no tension anywhere in the cross-section. So, the kern of an I-section is
(A) Rectangular in shape (B) Square in shape
(C) Circular in shape (D) Rhombus in shape

186. A short hollow cast iron column has a cross section of 300 cm^2 and the section modulus $Z = 10 \times 10^5$ mm^3 has
(i) Axial load of 250 kN
(ii) A load of 50 kN on a bracket attached to column whose load line is at 200mm from the axis of the column

The maximum and minimum stress intensities respectively are
(A) 10 MPa and 10 MPa (B) 10 MPa and 0 MPa
(C) 0 MPa and 10 MPa (D) None of the above

M

187. Match the List 1 (Cross Section) with List 2 (Shape of the core) to ensure no tension is developed in the cross section;

LIST 1	LIST 2
(a) Rectangular	1. Circle
(b) I-section	2. Rhombus
(c) Hollow section	3. Square
(d) Square section	4. Annular

Select the correct choice:

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

188. Which of the following equations is a correct equation for maximum bending stress at a section?

(A) $\frac{M}{Z} = \frac{\sigma}{y} = \frac{E}{R}$

(B) $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$

(C) $\frac{M}{y} = \frac{\sigma}{I} = \frac{E}{R}$

(D) $\frac{M}{y} = \frac{\sigma}{Z} = \frac{E}{R}$

189. A cantilever beam of T cross-section carries uniformly distributed load. Where does the maximum magnitude of bending stress occur?

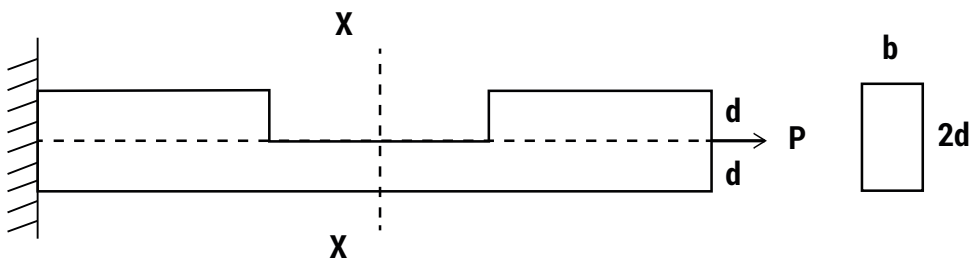
(A) At the top of cross-section

(B) At the junction of flange and web

(C) At the mid-depth point

(D) At the bottom of the section

190. Determine the maximum tensile stress at the section XX in the figure below:



(A) 2P/bd

(B) 4P/bd

(C) 6P/bd

(D) 8P/bd

191. A simple supported steel I beam is replaced by a C-channel made with aluminum. Both sections have similar moment of inertia and are subjected to same loading. The following will remain true,

(A) The maximum bending stress and deflection will remain unaltered

(B) Only the maximum bending stress will remain unaltered

(C) Only the maximum deflection will remain unaltered

(D) None of the above

192. A beam with uniform strength refers to which of the following?

(A) Where moment of inertia remains same all along the section

(B) Where bending stress is uniform at maximum bending moment of the section

(C) If the loading passes through the shear centre, the beam doesn't twist

(D) If the beam has two axes of symmetry, the shear center coincides with the centroid

193. Which of the following statements is not true with respect to shear center?

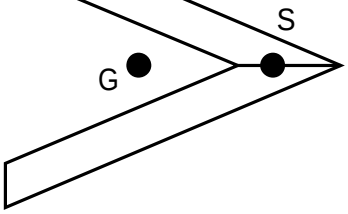
(A) If the loading passes through the shear centre, the beam doesn't twist

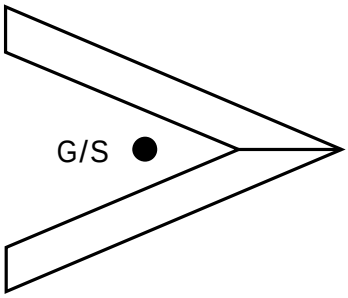
(B) It is a point where the resultant of shear force passes

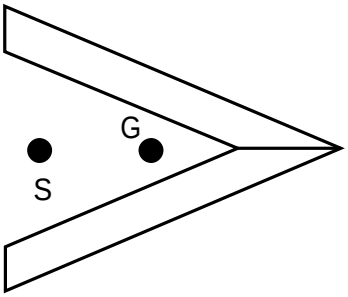
(C) If the beam has two axes of symmetry, the shear center coincides with the centroid

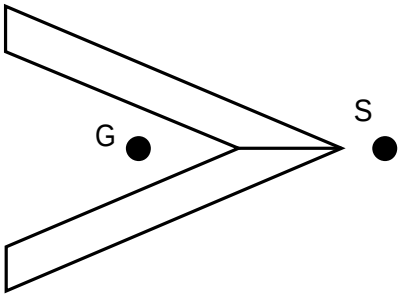
(D) In case of a channel section, the shear center lies at the center of the web coinciding with the y axis

194. In a thin-walled section shown below, the location of shear center 'S' is as per:

(A)


(B)


(C)


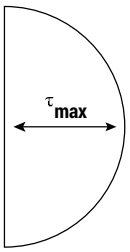
(D)


M

195. Transverse shear applied to a beam normally results in

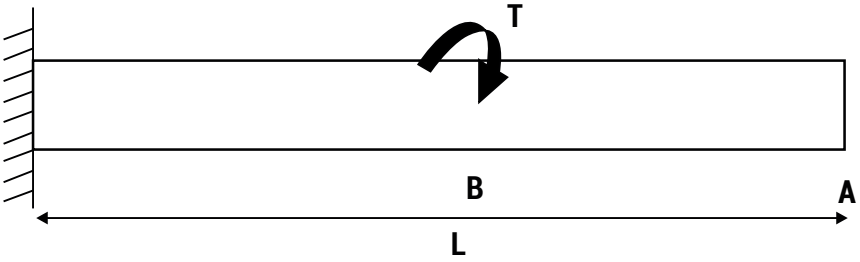
(A) Normal stress only
(B) Shear stress only
(C) Normal and shear stress
(D) Axial stress only

196. The following shear stress distribution profile belongs to which type of section?



(A) I – section and rectangular beam
(B) T- section only
(C) Rectangular and circular section
(D) Rectangular only

197. A bar of circular cross-section of diameter D is subject to a torque T at B as shown in figure given below.



What is the angle of twist at A ?

(A) Same as that at B
(B) Zero
(C) Twice as that at B
(D) Half as that at B

198. What would be the shape of the failure surface of a standard cast iron specimen subjected to torque?

(A) Cup and cone shape
(B) Plane surface perpendicular to the axis
(C) Pyramid type wedge shaped
(D) Helicoidal surface

199. A long shaft of diameter d is subjected to twisting moment T at its ends. The maximum normal stress acting at its cross-section is equal to

(A) Zero
(B) $16T/\pi d^3$
(C) $32T/\pi d^3$
(D) $64T/\pi d^3$

200. If two springs k_1 and k_2 are placed in parallel, the combined stiffness of spring is

(A) $k_1 + k_2$
(B) $k_1 + k_2 / (k_1 k_2)$
(C) $(k_1 k_2) / k_1 + k_2$
(D) $k_1 k_2$

201. Which method is suitable for analyzing a beam when the degree of kinematic indeterminacy is less than degree of static indeterminacy?

(A) Strain energy method

(B) Virtual work method

(C) Slope deflection method

(D) Castigliano's theorem (method of least work)

202. A statically indeterminate structure is the one which

(A) Cannot be analyzed at all

(B) Can be analyzed using equations of statics only

(C) Can be analyzed using equations of statics and compatibility equations

(D) Can be analyzed using equations of compatibility only

203. How is a truss, which undergoes rigid body translation for an arbitrary load, classified as?

(A) Determinate structure

(B) Geometrically unstable structure

(C) Statically unstable structure

(D) Structurally unstable structure

204. Which one of the following is a force method of structural analysis?

(A) Slope deflection method (B) Kani's method

(C) Moment distribution method (D) Strain energy method

205 Assertion (A): The principle of superposition for deflection of beams subjected to a number of loads can be applied in the case of large deformations.

Reason (R): In the principle of superposition, the resultant deflection due to all the loads will be the algebraic sum of the deflections due to each load acting separately.

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

206. Assertion (A): The slope deflection method is a stiffness method in which the joint displacements are found by applying the equilibrium conditions at each joint.

Reason (R): The displacements at a joint of a member are independent of the displacements of the member at the far end of the joint.

(A) Both A and R are true and R is the correct explanation of A

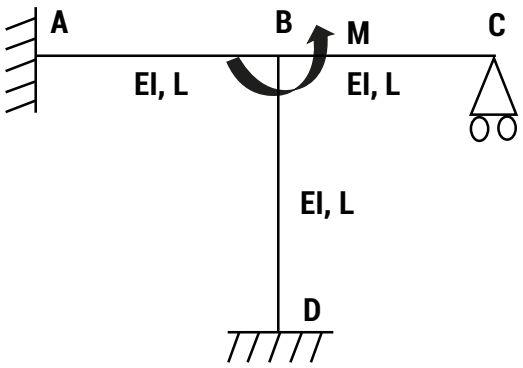
(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

M

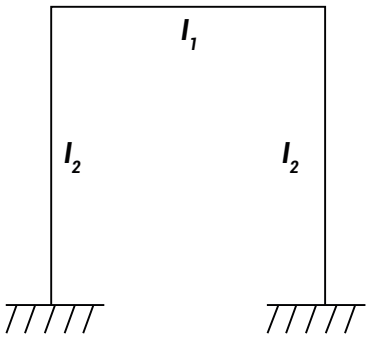
207. All members of the frame shown below have the same flexural rigidity EI and length L. If a moment M is applied at the joint B, then the rotation of the joint is



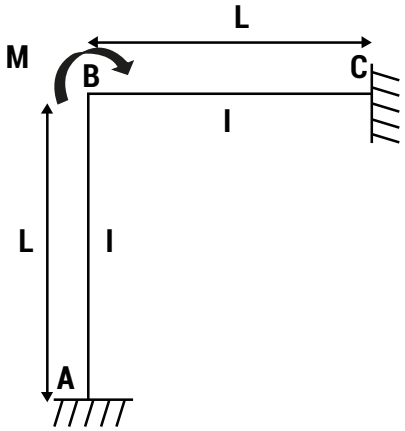
(A) ML/12EI
(B) ML/11EI
(C) ML/8EI
(D) ML/7EI

208. The rigid portal frame shown in the given figure will not have any side sway if (Note : I_1 = the moment of inertia of the column cross-section, I_2 = the moment of inertia of the beam cross-section)

(A) it is subjected to vertical loading only
(B) $I_2 = 2 I_1$
(C) $2I_2 = I_1$
(D) the loading is symmetrical about its center line



209. Members AB and BC shown in the figure below are identical. Due to a moment 2M applied at B, what is the value of axial force in the member AB?



(A) M/L (Compression)
(B) M/L (Tension)
(C) 0.75M/L (Compression)
(D) 0.75M/L (Tension)

210. The principle of superposition is not applicable when

(i) The material does not obey Hooke's law

(ii) The effect of temperature changes is taken into consideration

(iii) The structure is being analyzed for the effect of support settlement

Which of these statement(s) is/are correct?

(A) (i) only (B) (i) and (ii)

(C) (ii) and (iii) (D) (i), (ii) and (iii)

211. A beam carries uniformly distributed load throughout its length. In which of the following configuration will the strain energy be maximum?

(A) Cantilever (B) Simply supported beam

(C) Propped cantilever (D) Fixed

212. For a linear elastic structural analysis system, minimization of potential energy yields

(A) compatibility conditions (B) constitutive relations

(C) equilibrium equations (D) strain-displacement relations

213. Which of these are the assumptions made in the force analysis of simple trusses?

(i) All members have same cross-sectional area

(ii) The bending resistance of all the members is small in comparison with their axial force resistance

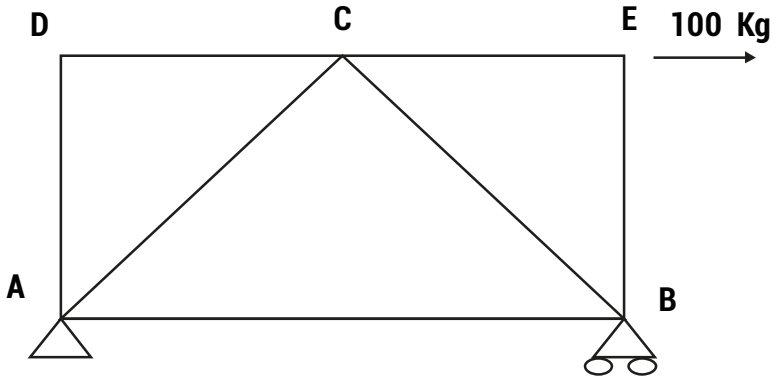
(iii) All the external loads are applied directly or indirectly at the joints

(iv) All joints are idealized to be frictionless hinges

(A) (i), (ii) and (iv) (B) (ii), (iii) and (iv)

(C) (i), (ii) and (iii) (D) (iii) and (iv)

214. Identify the members with zero member force in the following truss:



(A) AD, DC and EB (B) AD, DC and CE

(C) AD, AB and AC (D) None of the above

M

215. What is/are the use(s) of influence lines?

(i) To study the effect of moving loads on the structure

(ii) To calculate the value of stress function with the critical load condition

(iii) To find the position of live load for a maximum value of particular stress function

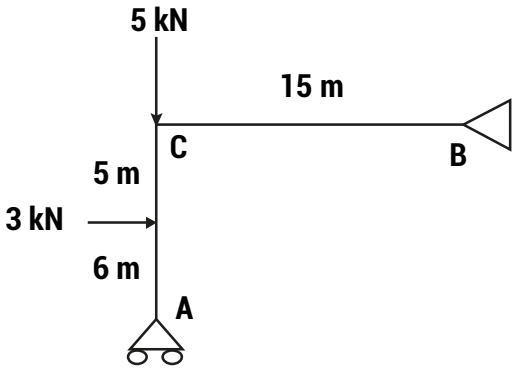
(A) Only (i) (B) (i) and (ii)

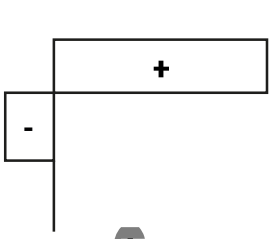
(C) (ii) and (iii) (D) (i), (ii) and (iii)

216. A bar of 80 mm diameter and 800 mm length is subjected to an axial load of 200 kN. It elongates by 0.30 mm and the diameter decreases by 0.01 mm. What is the Poisson's ratio of the material of the bar?

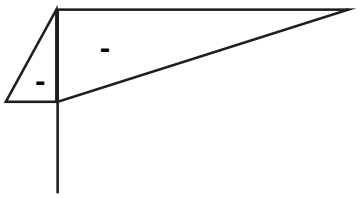
(A) 0.25 (B) 0.33 (C) 0.5 (D) 0.75

217. Select the Shear Force Diagram for the following beam:

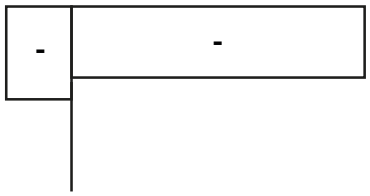




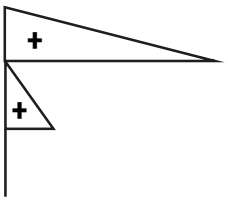
A.



B.



C.



D.

218. Which of the following instruments measure amplitude of a vibrating body?

(i) Vibrometers

(ii) Seismometer

(iii) Amplimeter

(A) (i) and (ii) (B) (ii) and (iii)

(C) (i) and (iii) (D) (i), (ii) and (iii)

219. Which of the following statement(s) is/are true?

(i) Magnification factor is minimum at resonance

(ii) The maximum value of amplification factor increases as damping factor decreases

(iii) The maximum value of amplification factor increases as damping factor increases

(iv) Magnification factor is maximum at resonance

(A) (i) and (ii) (B) (i) and (iii)

(C) (ii) and (iv) (D) Only (ii)

220. When there is a reduction in amplitude over every cycle of vibration, then the body is said to have

(A) free vibration (B) forced vibration

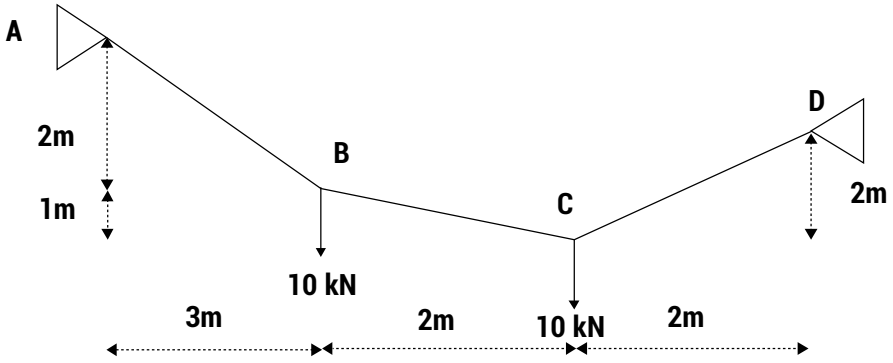
(C) damped vibration (D) underdamped vibration

221. It is generally assumed that the cable in a cable stayed bridge is

(A) perfectly flexible (B) perfectly inflexible

(C) extensible (D) perfectly flexible and extensible

222. A cable is suspended from supports A and B. It is loaded at point B and C. What is the force in cable CD?



(A) 12 kN (B) 10 kN (C) 14 kN (D) 20 kN

223. Diamond pattern of bolting is beneficial over chain and staggered bolting because

(A) It transmits maximum force (B) It has maximum efficiency

(C) It is easy to fabricate (D) It leads to minimum deflection

M

224. High Strength Friction Grip Bolts can be used for

(i) Slip resistant connection

(ii) Bearing type connection

(iii) Shear connection

(A) (i) and (ii) (B) (i) and (iii) (C) (ii) and (iii) (D) (i), (ii) and (iii)

225. The effective length of the fillet weld is given by:

(A) Total weld length

(B) Total weld length less twice the throat size

(C) Total weld length less weld size

(D) Total weld length less twice the weld size

226. Which one of the following is not a factor considered for calculating the net effective area of a tension member?

(A) Ductility factor (B) Geometry factor

(C) Shear lag factor (D) Buckling factor

227. A tension splice section is designed for

(A) Maximum factored tensile load

(B) Design strength of the tension member

(C) Maximum service load

(D) Maximum of factored tensile load and 0.3 times the design strength of tension member

228. The effect of shear lag is

(A) Less in small length of connection (B) Less in large length of connection

(C) Nonexistent in angle section (D) Nonexistent in channel section

229. Which of the following is/are considered as a limit state?

(i) Attainment of yield point of tension members

(ii) Excessive elongation of the tension members

(A) Only (i) (B) Only (ii)

(C) (i) and (ii) (D) None of the above

230. The effective depth of end battens should be

(i) More than twice the flange width of component columns

(ii) More than the distance between CG of component columns

(iii) Less than twice the flange width of component columns

(iv) Less than the distance between CG of component columns

(A) (i) and (ii) (B) (iii) and (iv) (C) (i) and (iv) (D) (ii) and (iii)

231. The maximum permissible slenderness ratio of single angle section connected with one bolt only and being used as a strut under dead and live loads is

(A) 350 (B) 300 (C) 250 (D) 180

232. Splices for a compression member are designed as

(A) Pedestal (B) Long column
(C) Compression block (D) Short column

233. In case of laterally supported beam, the design bending stress is governed by

(A) Lateral torsional buckling (B) Shear lag
(C) Yield stress (D) None of the above

234. The problem of web-crippling in beams is significant when

(i) Web is weak under concentrated loads
(ii) There is too much flexural moment
(iii) Compression flange is weak

(A) Only (i) (B) Only (ii)
(C) (i), (ii) (D) (i), (ii) and (iii)

235. The purpose of anchor bolts in column base is to

(i) Act as reinforcement in the concrete pedestal
(ii) To resist tension force
(iii) To keep the column in place

The correct purposes are

(A) (i) and (ii) (B) (ii) and (iii)
(C) (i) and (iii) (D) None of the above

236. The fasteners in gusseted base plate are designed for

(A) 25% column load (B) 50% column load
(C) 75% column load (D) 100% column load

237. The thickness of base plate is assessed from:

(A) Shear capacity of the plate (B) Flexural capacity of the plate
(C) Bearing strength of concrete (D) Two-way shear strength of concrete

238. To prevent local buckling in Plate girders, the horizontal stiffeners are provided

(A) at a distance 0.2 times the depth of web from compression end
(B) at a distance 0.2 times the depth of web from tension end
(C) at a distance 0.4 times the depth of web from compression end
(D) at a distance 0.4 times the depth of web from tension end

M

239. In case of bolted plate girder, the angle section that is used should be:

(A) Unequal with long leg connected (B) Unequal with short leg connected

(C) Equal angle (D) Equal angle connected back to back

240. Which of the following types of failure is more prone to take place when web of the plate girder is made too thick?

(A) Local buckling (B) Shear buckling

(C) Flexural buckling (D) Shear yielding

241. Gantry girders are designed for which of the following types of loads?

(i) Gravity loads (ii) Lateral Loads

(iii) Wind loads (iv) Longitudinal Loads

(A) (i) and (ii) (B) (i), (ii) and (iv)

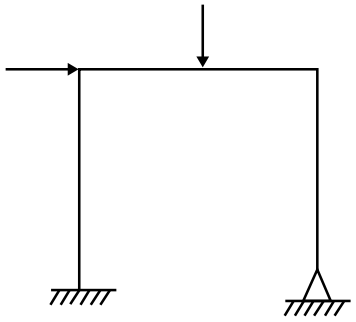
(C) (i), (iii) and (iv) (D) (i), (ii), (iii) and (iv)

242. Lateral load acting at the level of compressing flange of gantry girder is resisted by

(A) Tension flange (B) Compression flange

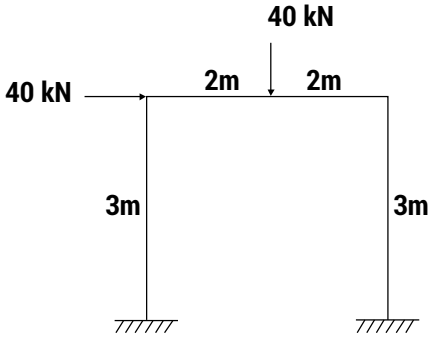
(C) Web (D) Lateral supports

243. What is the possible number of independent mechanism in the portal frame given below



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

244. If only a beam mechanism is possible in the frame given below, what will be the plastic moment M_p developed?



(A) 10 kNm (B) 20 kNm (C) 40 kNm (D) 80 kNm

245. Tensile stresses in concrete arise on account of the following:

(i) Direct tension (ii) Flexural tension

(iii) Diagonal tension (shear) (iv) Temperature and shrinkage

(A) (i) only (B) (i) and (ii)

(C) (ii), (iii) and (iv) (D) (i), (ii), (iii) and (iv)

246. Which is a correct formula for characteristic strength (F_{ck}) where F_m is mean strength and σ is standard deviation?

(A) $F_{ck} = F_m + 1.55\sigma$ (B) $F_{ck} = F_m + 1.65\sigma$

(C) $F_{ck} = F_m + 1.75\sigma$ (D) $F_{ck} = F_m + 1.85\sigma$

247. The limiting tensile strain in reinforced concrete is

(A) 0.002 (B) 0.0035

(C) 0.002 + fy/(1.15 Es) (D) 0.002 + 0.0035

248. Design compressive stress in concrete, for collapse in flexure, is taken as

(A) 0.77 fck (B) 0.67 fck

(C) 0.55 fck (D) 0.45 fck

249. The factor of safety for flexural compression in case of working stress method is

(A) 1.5 (B) 2 (C) 3 (D) 3.5

250. In limit state method, the failure criterion for reinforced concrete beam and column is based on

(A) Maximum principle stress theory (B) Maximum principle strain theory

(C) Maximum shear stress theory (D) Maximum normal stress theory

251. As per ductility criterion, which of the following section is preferred?

(A) Over reinforced section (B) Under reinforced section

(C) Balanced section (D) Doubly reinforced section

252. Which of the following cracks are the first cracks to be formed in an overloading scenario of an Over-reinforced RCC beam?

(A) Web shear cracks (B) Flexure shear cracks

(C) Flexural cracks (D) Concrete crushing

253. In reinforced concrete members, the best way to ensure adequate bond is

(A) To provide minimum number of large diameter bars

(B) To provide more number of small diameter bars

(C) To increase the cover for the reinforcement

(D) To provide additional stirrups

254. When HYSD bars are used in place of mild steel bars in a beam,

(A) Both bond strength and ductility increase

(B) Both bond strength and ductility decrease

(C) Bond strength increases and ductility decreases

(D) Bond strength decreases and ductility increases

255. Torsion resisting capacity of a Reinforced Concrete section

(A) Decreases with decrease in stirrups spacing

(B) Decreases with increase in longitudinal bars

(C) Does not depend upon stirrup and longitudinal steel

(D) Increases with the increase in stirrup and longitudinal steel

256. Focusing 'material efficiency', which of the following is the correct sequence?

(A) T-beam > Rectangular beam >Two-way slab

(B) T-beam < Rectangular beam <Two-way slab

(C) Two-way slab > T beam > Rectangular beam

(D) Two-way slab < T beam < Rectangular beam

257. If a square column section of size 400 mm × 400 mm is reinforced with 4 bars of 25 mm and 4 bars of 16 mm diameter, then the transverse steel should be

(A) 6 mm dia @ 250 mm c/c (B) 6 mm dia @ 300 mm c/c

(C) 8 mm dia @ 250 mm c/c (D) 8 mm dia @ 300 mm c/c

258. The depth of footing in case of an isolated column is governed by

(A) Bending moment and shear force

(B) Shear force and punching shear

(C) Bending moment and punching shear

(D) Bending moment and direct shear

259. If the lateral pressure on a retaining wall is high, the following measure are taken while designing:

(A) Wall thickness is increased to resist the moment at base

(B) Slab thickness is increased to resist the moment

(C) Height of the retaining wall to be increased to increase the moment resisting capacity

(D) Shear key is provided to resist the lateral pressure

260. In case of designing a water tank with Limit State Method, to control the cracking, the maximum stress in HYSD steel bars should not exceed

(A) 115 MPa (B) 125 MPa

(C) 130 MPa (D) 150 MPa

261. For pre-stressed structural elements, high strength concrete is used primarily because

(A) Both shrinkage and creep are more

(B) Shrinkage is less but creep is more

(C) Modulus of elasticity and creep values are higher

(D) High modulus of elasticity and creep values are lower

262. The loss in pre-stress in pre-tensioning system is primarily due to

(A) Elastic deformation of concrete and cable slippage

(B) Creep and elastic deformation

(C) Shrinkage and creep

(D) Shrinkage and elastic deformation

263. If a simply supported post-tensioned beam of span 'L' is pre-stressed by a straight tendon at a uniform eccentricity 'e' below the centroidal axis and a pre-stressing force 'P' with flexural rigidity of beam as EI, then the maximum central deflection of the beam is

(A) $PeL^2/ 8EI$ (downwards)

(B) $PeL^2/ 48EI$ (Upwards)

(C) $PeL^3/ 8EI$ (Upwards)

(D) $PeL^2/ 8EI$ (Upwards)

264. Which of the following is the first one to participate in hydration reaction of cement paste?

(A) Dicalcium silicate

(B) Tricalcium silicate

(C) Tricalcium aluminate

(D) Tetracalcium aluminoferrite

265. What kind of sample is used for tensile testing of mortars?

(A) Mortar prism (B) Mortar cylinder

(C) Mortar cube (D) Mortar briquette

266. Surkhi is added to lime mortar to

(A) Prevent shrinkage (B) Decrease setting time

(C) Increase bulk (D) Impart hydraulicity

267. Which of following is not a function of sand in mortar?

(A) Providing strength

(B) Reducing the consumption of cement

(C) Reducing shrinkage

(D) Reducing the setting time

268. Use of Sea water in making of concrete results into

(i) Loss of Strength (ii) Corrosion of reinforcement

(iii) Dampness (iv) Efflorescence

Which of the following is a correct combination?

(A) (i) and (ii) (B) (iii) and (iv)

(C) (i), (iii) and (iv) (D) (i), (ii), (iii) and (iv)

269. What is the equivalent strength of concrete for the Mix Ratio of 1:2:4?

(A) M10 (B) M15

(C) M20 (D) M25

270. In which of the following, the concrete is dropped from a height to measure its workability

(A) Slump Test (B) Vee Bee test

(C) Compaction factor test (D) Flow test

271. What is the most desirable form of coarse aggregates for developing a Mix Design in Laboratory?

(A) Bone dry aggregates

(B) Wet aggregates

(C) Saturated surface dry aggregates

(D) Saturated aggregates

272. Which type of aggregates give maximum strength to concrete?

(A) Flaky aggregates (B) Angular aggregates

(C) Rounded aggregates (D) Mixed aggregates

273. Consider the following strength of concrete:

(i) Cube strength (ii) Cylinder strength

(iii) Split-tensile strength (iv) Modulus of rupture

The correct sequence in increasing order of the strength is

(A) (iii), (iv), (ii), (i) (B) (iv), (iii), (ii), (i)

(C) (iii), (iv), (i), (ii) (D) (iv), (iii), (i), (ii)

274. For a given environment, the most significant factor that influences the total shrinkage of concrete is

(A) Cement content in mix

(B) Total amount of water added at the time of mixing

(C) Size of the member concreted

(D) Maximum size of the coarse aggregates

275. Number of bricks required for 1 cubic meter of brick masonry is

(A) 400 (B) 450

(C) 500 (D) 550

276. The process of mixing clay, water and other ingredients to make brick is known as

(A) Kneading (B) Moulding

(C) Pugging (D) Blending

277. Which of the following yields hard wood?

(A) Deodar (B) Chir

(C) Shishum (D) Pine

278. In which of the following directions, the strength of timber is maximum?

(A) Parallel to grain (B) 45^{o} to grains

(C) Perpendicular to grains (D) Same in all directions

279. The most pure form of iron is

(A) Cast iron (B) Pig iron

(C) Steel (D) Wrought iron

280. Match List – I (Admixtures) with List II (Chemicals) and select the correct answer using the options given below:

List – I	List II
P. Water-reducing admixture	1. Sulphonated melanin formaldehyde
Q. Air-entraining agent	2. Calcium chloride
R. Super plasticizer	3. Lignosulphonate
S. Accelerator	4. Neutralized vinsol resin

	P	Q	R	S
(A)	2	4	1	3
(B)	1	3	4	2
(C)	3	4	1	2
(D)	3	4	2	1

M

281. Why is super plasticizer added to concrete?

(i) To reduce the quantity of mixing water

(ii) To increase workability

(iii) To reduce the quantity of cement

(iv) To increase early age strength

(A) (i) and (iv) (B) (i), (ii) and (iv)

(C) (iii) and (iv) (D) (i), (ii), (iii) and (iv)

282. Which of the following are the examples of Industrial Timber?

(i) Veneers (ii) Plywood

(iii) Block Board (iv) Impreg Timber

(A) (i) and (ii) (B) (i), (ii) and (iii)

(C) (ii), (iii), (iv) (D) (i), (ii), (iii), (iv)

283. Shielding glass consists high content of

(A) Lead oxide (B) Manganese dioxide

(C) Tin oxide (D) Cobalt oxide

284. The purpose of providing cavity wall is

(i) to prevent dampness

(ii) heat insulation

(iii) sound insulation

(A) Only (i) (B) Only (ii)

(C) (i) and (ii) (D) (i), (ii) and (iii)

285. A temporary structure that is built to support an unsafe structure is called

(A) scaffolding (B) jacking

(C) shoring (D) underpinning

286. A type of bond in a brick masonry consisting of alternate course of headers and stretchers is called

(A) English bond (B) Flemish bond

(C) Stretcher bond (D) Header bond

287. 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.

288. Which of the following is/are incorrect about a staircase?

(i) String is the part of tread which is projecting beyond the face of the riser

(ii) Soffit is a sort of additional moulding provided under the nosing or tread to beautify the step in elevation

(iii) Baluster is a member supporting the hand rail

(iv) Newel post is a vertical member at the ends of flights

(A) Only (i) (B) (i) and (ii)

(C) (i) and (iii) (D) (ii) and (iv)

289. A good staircase should preferably have the maximum and minimum pitch respectively as

(A) 90° and 0° (B) 75° and 15°

(C) 60° and 30° (D) 45° and 25°

290. Doglegged stairs are

(A) Half turn stairs (B) Quarter turn stairs

(C) Straight stairs (D) Three quarter turn stairs

291. 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

292. The maximum slenderness ratio for a load bearing is

(A) 13 (B) 20

(C) 27 (D) 37

293. Crushing strength of a first class brick should not be less than

(A) 3.5 N/mm^2 (B) 7.0 N/mm^2

(C) 10.5 N/mm^2 (D) 14.0 N/mm^2

294. The main constituent of cement which is responsible for the initial setting of the cement is

(A) Tricalcium aluminate

(B) Dicalcium silicate

(C) Tricalcium silicate

(D) Tetracalcium alumina ferrite

295. For getting Green coloured cement, which pigment has to be added during the grinding of the cement clinkers?

(A) Barium manganate (B) Chromium oxide

(C) Oxides of Iron (D) Oxides of Cobalt

296. The most commonly used retarder in cement is

(A) Gypsum
(B) Calcium Chloride
(C) Calcium Carbonate
(D) Magnesium Chloride

297. Desire lines are plotted in

(A) traffic volume studies
(B) speed studies
(C) accident studies
(D) origin and destination studies

298. According to IS Classification system, the soils can be classified into

(A) 18 Groups
(B) 15 Groups
(C) 3 Groups
(D) 7 Groups

299. Flow between any two points in a soil depends only on the difference in

(A) Pressure head
(B) Total head
(C) Velocity head
(D) Datum head

300. Pascal-second is the unit of

(A) Pressure
(B) Kinematic viscosity
(C) Dynamic viscosity
(D) Surface tension

———————