CODE: AE-CV

M.Tech. Common Entrance Test, PGCET – 2010

Civil Engineering

Time: 2 Hours **Max. Marks: 100**

Read the following instructions before answering the test

i) **Write / Darken the particulars of your identity, Test Seat Number and affix your signature on the OMR Response Sheet before the start of the test.**

ii) **All Questions have multiple choices of answers, of which only one is correct.**

iii) **Mark the correct answer by completely darkening only one oval against the Question number using Black Ink Ball Point pen only.**

iv) **There will be no negative evaluation with regard to wrong answers. Marks will not be awarded if multiple answers are given.**

v) **Do not make any stray mark on the OMR Response sheet. For rough work, use blank page on the question paper.**

vi) **Taking the question paper out of the test hall is permitted only after the full duration of the test.**

vii) **Use of only non-programmable calculator is permitted.**

viii) **START ANSWERING ONLY AT THE SPECIFIED TIME WHEN THE INVIGILATOR GIVES INSTRUCTIONS.**

MARKS DISTRIBUTION

PART – I	50 Questions :	50 x 1 = 50 Marks
PART – II	25 Questions :	25 x 2 = 50 Marks
		Total = 100 Marks

PART-I

Each Question Carries One Mark **50 x 1 = 50 Marks**

1. For any system of coplanar forces to be in equilibrium,
   (a) Algebraic sum of the horizontal components of all the forces should be zero
   (b) Algebraic sum of the vertical components of all the forces should be zero
   (c) Algebraic sum of the moments of all the forces about any point should be zero
   (d) All of the above.

2. The bending moment at a beam cross-section, where shear force is zero, is
   (a) zero (b) maximum
   (c) minimum (d) either maximum or minimum.

3. The statement that a plane section of a bar under twisting before the application of twisting moment remains plane after the application of twisting moment is valid for
   (a) all types of cross section
   (b) all types of cross section with curved boundaries
   (c) only solid circular section
   (d) only circular cross sections hollow or solid.

4. A prismatic beam fixed at both ends carries a uniformly distributed load over the entire span. The ratio of bending moment at support to bending moment at midspan is
   (a) 0.5 (b) 1.0 (c) 1.5 (d) 2.0

5. The mortar in which, both cement and lime are used as binding materials, is called
   (a) Light weight mortar (b) Fire resistant mortar
   (c) Gauged mortar (d) Lime mortar

6. For a water-cement ratio of 0.6, the water content per bag of cement is
   (a) 10 kg (b) 20 kg (c) 30 kg (d) 40 kg

7. A roof which slopes in four directions is called
   (a) Shed roof (b) Gable end roof (c) Hipped roof (d) Gambrel roof

8. The formwork for the sides of a reinforced concrete beam can be removed only after
   (a) 1 day (b) 4 days (c) 7 days (d) 14 days

9. The number of treads in a flight is equal to
   (a) Risers in the flight (b) Risers plus one
   (c) Risers minus one (d) None of the above.

10. If the smallest division of a vernier is longer than the smallest division of its primary scale, the vernier is known as
(a) Direct vernier (b) Double vernier (c) Retrograde vernier (d) Simple vernier.

11. Locating the position of a plane table station with reference to three known points, is known as
(a) Intersection method (b) Radiation method
(c) Resection method (d) Three point problem.

12. An ideal vertical curve to join two gradients is
(a) Circular (b) Parabolic (c) Elliptical (d) Hyperbolic

13. Equation of continuity of flow is based on the principle of conservation of
(a) Mass (b) Momentum (c) Force (d) None of these

14. Hydraulic radius is equal to
(a) Area divided by the square of wetted perimeter
(b) Area divided by wetted perimeter
(c) Wetted perimeter divided by the area
(d) Square root of the area

15. Shear span is defined as zone where
(a) Bending moment is zero (b) Shear force is zero
(c) Shear force is constant (d) Bending moment is constant

16. The characteristic strength of concrete as per IS-456, is defined as that compressive strength below which not more than
(a) 10 percent of test results fall (b) 5 percent of test results fall
(c) 2 percent of test results fall (d) None of the above

17. The permanent deformation of concrete with time, under sustained load is called
(a) Creep (b) relaxation (c) viscosity (d) viscoelasticity

18. In a singly reinforced beam, the effective depth is measured from its compression edge to
(a) Tensile edge (b) Tensile reinforcement
(c) Neutral axis (d) Longitudinal central axis

19. An R C T-beam behaves as a rectangular beam of width equal to flange width if its neutral axis
(a) Remains within the flange
(b) Remains below the flange
(c) Coincides with the geometric centre of the section
(d) None of the above.

20. The shear reinforcement in Reinforced Concrete is provided to resist
    (a) Vertical shear (b) Horizontal shear
    (c) Diagonal compression (d) Diagonal tension.

21. A column splice is used to increase
    (a) length of the column (b) strength of the column
    (b) Cross-sectional area of the column (d) None of the above

22. The method of design of steel framework for greatest rigidity and economy in weight is known as
    (a) Simple design (b) Semi-rigid design (c) Fully rigid design (d) None of the above

23. If the coefficient of active earth pressure is 1/3, then the coefficient of passive earth pressure is
    (a) 1/3 (b) 2/3 (c) 1 (d) 3

24. The ratio of settlement of soil at any time 't' to the final settlement is known as
    (a) Coefficient of consolidation (b) Degree of consolidation
    (c) Consolidation index (d) Consolidation of undisturbed soil

25. Compression of soil occurs rapidly if voids are filled with
    (a) Air (b) Water
    (c) Partly with air and partly with water (d) None of these

26. At a point in a loaded soil medium, the normal stress is maximum on
    (a) Minor principal plane (b) Intermediate principal plane
    (c) Major principal plane (d) None of these

27. Toughness index of soil is the ratio of
    (a) Consistency index to flow index (b) Flow index to plasticity index
    (c) Liquidity index to flow index (d) Plasticity index to flow index

28. Which one of the following is taken into consideration while determining overtaking sight distance in four lane highway?
    (a) Distance covered during reaction time
    (b) Distance covered during overtaking operation
    (c) Reaction time plus overtaking distance
    (d) Distance covered during reaction time plus distance covered during overtaking operation plus the distance covered by the opposing traffic

29. Length of a vehicle affects
    (a) Width of traffic lanes
    (b) Extra width of pavement and minimum turning radius
    (c) Width of shoulders and parking facilities
    (d) Clearance to be provided under structures such as overbridges, underbridges etc.

30. In which of the following traffic signal systems are the cycle length and cycle division automatically varied?
    (a) Simultaneous system (b) Alternate system
    (c) Simple progressive system (d) Flexible progressive system

31. Bankelman beam deflection method is used for design of
    (a) Rigid overlay on rigid pavement (b) Flexible overlay on flexible pavement
    (c) Flexible overlay on rigid pavement (d) Rigid overlay on flexible pavement

32. Which of the following represents a carpet of sand-bitumen mix without coarse aggregates?
    (a) Mastic asphalt (b) Sheet asphalt
    (c) Bituminous carpet (d) Bituminous concrete

33. Standard broad gauge width is
    (a) 1.76 m (b) 1.86 m (c) 1.67 m (d) 1.68 m

34. The hauling capacity of a locomotive depends
    (a) Load on driving wheel (b) Friction
    (c) Both (a) and (b) (d) None of the above

35. Of the following, select the correct statement
    (a) Traffic volume should always be more than traffic capacity
    (b) Traffic capacity should always be more than traffic volume
    (c) Spot speed is the average speed of a vehicle at a specified section
    (d) 85^{th} percentile speed is more than 98^{th} percentile speed.

36. Rainfall mass curve shows the variation of
    (a) Rainfall intensity with time (b)Rainfall intensity with cumulative rainfall
    (c) Rainfall excess with time (d) Cumulative rainfall with time

37. A linear reservoir is one in which
    (a) Storage varies linearly with time (b) Storage varies linearly with outflow rate
    (c) Storage varies linearly with inflow rate (d) Storage varies linearly with elevation

38. If the intensity of rainfall is more than the infiltration capacity of soil, then the infiltration rate will be
    (a) equal to the rate of rainfall (b) Equal to infiltration capacity
    (c) More than rate of rainfall (d) More than infiltration capacity.

39. The statement that " the ordinate of the direct runoff hydrographs of a common base period are directly proportional to the volumes of runoff represented by the respective hydrograph" is known as
    (a) Principle of linearity (b) Principle of time invariance
    (c) Principle of uniformity (d) None of the above.

40. A deep well
(a) Is always deeper than a shallow well (b)Is weaker structurally than a shallow well
(c) Has more discharge than a shallow well (d) All of the above.

41. The duty of a crop is 432 hectares/cumec when the base period of the crop is 100 days. The delta for the crop will be in cm
(a) 132 (b) 200 (c) 464 (d) 864

42. The uplift pressure on the face of a drainage gallery in a dam is equal to
(a) Hydrostatic pressure at toe
(b) Hydrostatic pressure at heel
(c) Two-third of hydrostatic pressure at toe plus one-third of hydrostatic pressure at heel
(d) None of the above.

43. The overfall of a spillway in the shape of a double or S-curve, which is convex at the top and concave at the bottom is called
(a) Ogee spillway (b) S-spillway (c) Oval spillway (d) Zig-zag spillway

44. The most suitable section of a lined canal is
(a) Triangular section with circular bottom for small canals
(b) Trapezoidal section with rounded corners for large canals
(c) Both (a) and (b) above
(d) None of the above.

45. Bligh's creep theory assumes that
(a) The percolation water creep is along the contact of the base profile of the apron with the subsoil
(b) The percolation water creep is in a straight path under the floor
(c) The percolation water creep is in a straight path under the foundation
(d) None of the above.

46. Aeration of water is done for the removal of
(a) Hardness (b) Turbidity (c) Colour (d) Odour

47. An earth formation which, although porous and capable of absorbing water does not provide an appreciable supply to wells, is known as
(a) Acquifer (b) Acuiclude (c) Aquifuge (d) None of these

48. In septic tanks, decomposition of organic bacteria is done by
(a) Anaerobic bacteria (b) Aerobic bacteria
(c) Both types of bacteria (d) None of these

49. In water distribution pipes, air valves are provided at

(a) Lower points (b) Junction points (c) Higher points (d) Anywhere

50. Biochemical Oxygen Demand (BOD) of safe drinking water must be

(a) Nil (b) 5 (c) 10 (d) 15

PART - II

Each Question Carries Two Marks **25 x 2 = 50 Marks**

51. The principal stresses at a point in a loaded material are 80 MPa, 30 MPa and -40 MPa. The maximum shear stress at the point is

(a) 25 MPa (b) 35 MPa (c) 55 MPa (d) 60 MPa

52. What is the safe stopping sight distance for design speed of 50 kmph two way traffic on a two lane road assuming coefficient of friction as 0.37 and reaction time as 2.5 second?

(a) 55.2 m (b) 61.4 m (c) 71.5 m (d) 65.6 m

53. The maximum bending moment induced in a simply supported beam of span 5 m and carrying uniformly distributed load of intensity 10 kN/m is

(a) 31.25 kNm (b) 41.25 kNm (c) 25.00 kNm (d) 20.83 kNm

54. For a certain material, the Young's modulus is 200 GPa and the modulus of rigidity is 80 GPa. The value of Poisson's ratio is

(a) 0.15 (b) 0.20 (c) 0.25 (d) 0.30

55. The shear force on a rectangular beam section 200 mm x 400 mm is 10 kN. The maximum shear stress induced is

(a) 0.1875 MPa (b) 0.1375 MPa (c) 0.125 MPa (d) 0.2 MPa

56. For a cantilever beam of span 2m carrying a udl of 2 kN/m and a point load of 10 kN at the free end, the maximum bending moment induced is

(a) 24 kNm (b) 20 kNm (c) 4 kNm (d)None of the above

57. A solid circular shaft is subjected to pure torsion. The ratio of maximum shear stress to maximum normal stress at any point is

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

58. An axially loaded RC column of effective length 3 m has a cross section of 300 mm x 300 mm. The minimum eccentricity of load that must be allowed for in the design as per IS: 456 – 2000 is

(a) zero (b) 10 mm (c) 16 mm (d) 20 mm

59. A circle of radius 7m has a standard error of 0.02 m on the radius. The standard error of its area is

(a) 0.04 m^2 (b) 0.14 m^2 (c) 0.28 m^2 (d) 0.88 m^2

60. The allowable bearing capacity at 25 mm allowable settlement for a footing in a sandy soil is 15 kN/m^2. The allowable bearing capacity for the same footing permitting a settlement of 40 mm is

(a) 24 kN/m^2 (b) 30 kN/m^2 (c) 35 kN/m^2 (d) 40 kN/m^2

61. In a saturated soil deposit having a density of 22 kN/m^3, the effective normal stress on a horizontal plane at 5 m depth will be

(a) 22 kN/m^2 (b) 50 kN/m^2 (c) 60 kN/m^2 (d) 110 kN/m^2

62. A clay sample has a void ratio of 0.54 dry state. The specific gravity of soil solid is 2.7. The shrinkage limit of the soil is

(a) 8.5% (b) 10.0% (c) 17.0% (d)20.0%

63. When the water surface coincides with the top edge of a rectangular vertical gate 40 m wide x 3m deep, then the depth of the centre of pressure is

(a) 1.0 m (b) 1.5 m (c) 2.0 m (d) 2.5 m

64. The normal annual precipitation at stations X, A, B and C are 700 mm, 1000 mm, 900 mm and 800 mm respectively. If the storm precipitation at the three stations A, B and C were 100 mm, 90 mm and 80 mm respectively, then the storm precipitation for station X will be

(a) 70 mm (b) 80 mm (c) 90 mm (d) 105 mm

65. A city supply of 15000 m^3 of water per day is treated with a chlorine dosage of 0.5 ppm. For this purpose, the requirement of 25% bleaching powder per day would be

(a) 300 kg (b) 75 kg (c) 30 kg (d) 7.5 kg

66. If the deoxygenation coefficient of a stream at 20^0 C is 0.1, then its value at 22^0 C will be

(a) 0.120 (b) 0.200 (c) 0.180 (d) 0.109

67. If the present population is 47,000 and the average increase in population is 5,500, then the future population after one decade by arithmetic increase method is

(a) 52,500 (b) 54,000 (c) 50,000 (d) 55,000

8. In a BOD test, 1.0 ml of raw sewage was diluted to 100 ml and the dissolved oxygen concentration of diluted sample at the beginning was 6 ppm and it was 4 ppm at the end of 5 day incubation at 20^0 C. The BOD of raw sewage will be

(a) 100 ppm (b) 200 ppm (c) 300 ppm (d) 400 ppm

9. If the area of drainage is 200 hectares, intensity of rainfall is 40 mm/hectare and coefficient of runoff is 0.44, then the runoff water discharge by rational method is

(a) 16.200 m^3/sec (b) 9.778 m^3/sec (c) 12.300 m^3/sec (d) 14.500 m^3/sec

0. The radius of a horizontal circular curve is 100 m. The design speed is 50 kmph and the design coefficient of lateral friction is 0.15. The superelevation required, if full lateral friction is assumed to develop, is

(a) 0.047 (b) 0.037 (c) 0.057 (d) 0.000

1. The degree of a horizontal curve of radius 100 m (based on 30 m chain) is

(a) 17.19 m (b) 18.19 m (c) 16.19 m (d) 30.00 m

2. A tacheometer has a multiplying constant of 100 and no additive constant. The stadia readings taken at station B (with axis horizontal) are 2.048/1.524/1.000. The horizontal distance between the tacheometer and station B is

(a) 104.8 m (b) 114.8 m (c) 94.8 m (d) 106.8 m

3. The depth of the critical neutral axis (limit state method) for a rectangular reinforced concrete section having an effective depth of 500 mm and Fe 415 bars is

(a) 240 mm (b) 340 mm (c) 140 mm (d) 250 mm

4. A laced steel column is designed to carry an axial load of 500 kN. The total transverse shear to be resisted by lacing is

(a) 25 kN (b) 12.5 kN (c) 6.25 kN (d) 15 kN

5. The plastic modulus of a section is 4.8×10^{-4} m^3. The shape factor is 1.2. The plastic moment capacity of the section is 120 kNm. The yield stress of the material is

(a) 100 MPa (b) 240 MPa (c) 250 MPa (d) 300 MPa

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