

ENTRANCE EXAMINATION FOR ADMISSION, MAY 2011.

Ph.D. (CIVIL ENGINEERING)

COURSE CODE : 137

Register Number :

*Signature of the Invigilator
(with date)*

COURSE CODE : 137

Time : 2 Hours

Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you -1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. Factor of safety is
 - (A) Ultimate stress/working stress
 - (B) Working stress/ ultimate stress
 - (C) Ultimate load/ Poisson's ratio
 - (D) None of these
2. The load required to produce a unit deflection in a spring is called
 - (A) Flexural rigidity
 - (B) Torsional rigidity
 - (C) Spring stiffness
 - (D) Young's modulus
3. Minimum limiting load at which the column tends to have lateral displacement is known as
 - (A) Critical load
 - (B) Bucking load
 - (C) Crippling load
 - (D) Any of the above
4. The energy stored in a body when strained within elastic limit is known as
 - (A) Resilience
 - (B) Proof resilience
 - (C) Strain energy
 - (D) Impact energy
5. When a load on the free end of cantilever beam is increased failure will occur
 - (A) At the free end
 - (B) At the fixed end
 - (C) In the middle to the beam
 - (D) At a distance $2/3$ from free end
6. When a beam is subjected to a bending moment the strain in a layer is _____ the distance from the neutral axis
 - (A) Equal to
 - (B) Directly proportional to
 - (C) Inversely proportional to
 - (D) Independent of
7. The bending stress in a beam is section modules
 - (A) equal to
 - (B) less than more that
 - (C) more than
 - (D) directly proportional to
8. A Couple can be balanced by
 - (A) An equal and opposite couple
 - (B) Another couple
 - (C) A torque
 - (D) None of the above
9. The effect of a given force remains unaltered along the line of action. This is according to
 - (A) Resolution
 - (B) Law of motion
 - (C) Law of transmissibility
 - (D) Newton's law

10. In a rectangular beam the maximum shear stress occurs at
 (A) top fibre of the section (B) anywhere across the depth
 (C) bottom of the section (D) neutral axis
11. A UDL on a cantilever gives on the SFD a
 (A) Linear line (B) Cubic curve
 (C) Parabolic curve (D) None of the above
12. Bending moment is maximum where shear force is
 (A) Zero (B) Maximum (C) Constant (D) Uniform
13. The free body diagram of a joint should satisfy which of the following equilibrium equations
 (A) $\sum H = 0, \sum M = 0$ (B) $\sum V = 0, \sum M = 0$
 (C) $\sum H = 0, \sum V = 0$ (D) $\sum M = 0$
14. If the section modulus of a beam decreases, then the bending stress will
 (A) decrease (B) remain same
 (C) increase (D) there is no such correlation
15. A hyetograph is a plot of
 (A) Cumulative rainfall vs time (B) Rainfall intensity vs time
 (C) Rainfall depth vs duration (D) Discharge vs time
16. Direct runoff is made up of
 (A) Surface runoff, prompt interflow, and channel precipitation
 (B) Surface runoff, infiltration and evapo-transpiration
 (C) Overland flow only
 (D) Rainfall and evaporation
17. A 6 hrs storm with a uniform intensity of 1.5 cm/h produced a runoff depth of 72 mm. The average infiltration rate during this storm is
 (A) 3 mm/h (B) 6 mm/h (C) 9 mm/h (D) 12 mm/h
18. Surface tension of a fluid
 (A) Depends on the forces of molecular attraction
 (B) Is inversely proportional to fluid density
 (C) Is zero when the fluid is at rest
 (D) Is the result of interaction

19. Viscosity of a gas
 (A) Increases with decrease in temperature
 (B) Increases with increase in temperature
 (C) Is independent of temperature
 (D) Increases up to a critical
20. The pressure at a point in a static liquid depends on the
 (A) Depth of the container
 (B) Depth of point below free surface and specific weight of liquid
 (C) Depth of point below free surface
 (D) Depth of container and specific weight of liquid
21. A vertical triangular area of altitude h has one side in the free surface of a liquid. Its vertex is downward. The depth of its centre of pressure is
 (A) $0.8 h$ (B) $0.75 h$ (C) $0.5 h$ (D) $h/3$
22. The Surveying used to determine additional details such as boundaries of field is called
 (A) City surveying (B) Location Surveying
 (C) Cadastral Surveying (D) Topographical Surveying
23. The fundamental Principle of Surveying is to work from the
 (A) Whole to the Part (B) Part to the Whole
 (C) Lower level to higher level (D) Higher level to lower level
24. When 1 cm on a map represents 10 m on the ground. The representative fraction of the scale is
 (A) $1/10$ (B) $1/100$ (C) $1/1000$ (D) $1/10000$
25. The method of measuring distance by pacing is chiefly used is
 (A) Reconnaissance survey (B) Preliminary survey
 (C) Location Surveying (D) All of the above
26. The error in measured Length due to in correct holding of chain
 (A) Compensating error (B) Cumulative error
 (C) Instrumental error (D) Negative error
27. When the position of points to be located accurately by a Perpendicular offset, the direction of perpendicular is set out by means of
 (A) Theodolite (B) Optical square
 (C) Dumpy level (D) Planimeter

28. An imaginary line joining the point of intersection of the cross hairs of the diaphragm and the optical centre of the object glass is
 (A) Fundamental line (B) Axis of telescope
 (C) Axis of level tube (D) Line of collimation
29. Coincident draft in relation to water demand is based on
 (A) Peak hourly demand (B) Max daily demand
 (C) Max daily demand + fire demand (D) Greater of (A) and (C)
30. The population of a town in three consecutive decades are : 1 lakh, 1.4 lakh, and 1.68 lakh respectively. The population in the fourth decade according to geometric method, would be
 (A) 1.9 lakh (B) 2.184 lakh (C) 2.2 lakh (D) 2.5 lakh
31. Presence of Algae in water indicates that the water is
 (A) Hard (B) Soft (C) Acidic (D) Pure
32. Service connection consists of
 (A) Ferrule, stopcock and gooseneck (B) Ferrule, check valve and gooseneck
 (C) Stop cock, meter and sluice valve (D) Sluice valve, check valve and meter
33. Membrane filter technique is used for testing
 (A) E-Coli (B) Copper
 (C) Pathogenic bacteria (D) Boron
34. For a flow of 5.7 MLD (million liter day) and a detention time of 2 hours, the surface area of a rectangular sedimentation tank to remove all particles having settling velocity of 0.33 mm/s is
 (A) 20 m² (B) 100 m² (C) 200 m² (D) 400 m²
35. Settling velocities of spherical bodies in still water is given by
 (A) Lacey's equation (B) Darcy's equation
 (C) Hazen William's equation (D) Stoke's equations
36. The allowable tensile stress in HYSD stirrups used in reinforced cement concrete is (in MPa)
 (A) 140 (B) 190 (C) 230 (D) 260
37. If the modular ratio is 'm', steel ratio is 'r', the critical neutral axis constant 'k' is given by
 (A) $\frac{m}{m-r}$ (B) $\frac{m}{m+r}$ (C) $\frac{m+r}{m}$ (D) $\frac{m-r}{m}$

38. The maximum diameter of the reinforcement bars in RCC beams is limited to
 (A) 28 mm
 (B) 40 mm
 (C) One-eighth of the least dimension of the beams
 (D) One-tenth of the depths of beams
39. The deflection including the effects of temperature, creep and shrinkage occurring after erection of partitions and the application of finishes should not normally exceed
 (A) $\frac{\text{span}}{250}$ or 20 mm whichever is less (B) $\frac{\text{span}}{250}$
 (C) $\frac{\text{span}}{350}$ or 20 mm whichever is less (D) $\frac{\text{span}}{350}$
40. The effective length of column with one end effectively held in position and other restrained against rotation at both directions is
 (A) $2l$ (B) $1.2l$ (C) l (D) $0.65l$
41. The minimum number of longitudinal steel bars in helically reinforced RCC columns must be
 (A) 2 (B) 4 (C) 6 (D) 8
42. The minimum factor of safety against overturning for a retaining wall is
 (A) 3.0 (B) 2.0 (C) 1.5 (D) 1.0
43. The post-tender stage of construction consist of
 (A) Assessment of work
 (B) Assessment of expenditure during execution
 (C) Finalization of accounts
 (D) All of the above
44. The construction of airports are treated as
 (A) light construction (B) heavy construction
 (C) industrial construction (D) study and evaluation
45. The major principle of an organization is
 (A) Principle of span of management (B) Principle of unity of command
 (C) Principle of delegation (D) Scalar principle
46. Bar chart is suitable for
 (A) large project (B) major work
 (C) minor work (D) all of the above

47. The start or completion of task is called
 (A) As event (B) As activity
 (C) A duration (D) Any of the above
48. CPM requires
 (A) Single time estimate (B) Double time estimate
 (C) Triple time estimate (D) None of the above
49. The estimated time required to complete an activity is known as
 (A) Duration (B) Float
 (C) Restraint (D) All of the above
50. The commonly used test method to determine workability of concrete in the construction site is
 (A) Slump Test (B) Compaction factor test
 (C) Flow Table test (D) Vee-bee consistometer test
51. Plasticizers are added to concrete to
 (A) Decrease workability of concrete at higher w/c ratio
 (B) Increase workability of concrete at lower w/c ratio
 (C) Maintain the workability of concrete
 (D) All the above
52. What is the unit weight of reinforced cement concrete as per IS 456 – 2000?
 (A) 25 kN / m³ (B) 24 kN / m³ (C) 24.50 kN / m³ (D) 25.50 kN / m³
53. In normal circumstances, corrosion of steel in concrete is accelerated when reinforced concrete elements are exposed to
 (A) Completely immersed in water (B) Dry atmosphere
 (C) Alternate wetting and drying (D) Snow fall
54. Modulus of elasticity of concrete, E_c of concrete in terms of strength of concrete, f_{ck} is
 (A) $E_c = 5200\sqrt{f_{ck}}$ (B) $E_c = 5300\sqrt{f_{ck}}$
 (C) $E_c = 5400\sqrt{f_{ck}}$ (D) $E_c = 5000\sqrt{f_{ck}}$
55. The strength of concrete for an existing structural member can be found out by conducting
 (A) Rebound hammer test (B) Concrete core test
 (C) Ultrasonic pulse velocity test (D) All the above

56. The final setting time of cement should not exceed
(A) 250 minutes (B) 450 minutes (C) 600 minutes (D) 550 minutes
57. Which of the following tests is performed in the laboratory to determine the extent of weathering of aggregates for road works?
(A) Soundness test (B) Crushing test
(C) Impact test (D) Abrasion test
58. Which of the following methods is used in the design of rigid pavements?
(A) CBR method (B) Group index method
(C) Westergards (D) McLeod method
59. Which set of traffic is needed for functional design as well as for highway capacity design?
(A) O/D studies (B) Parking and accident
(C) Speed & volume studies (D) Axle load studies
60. Which of the following equipments is useful in determining the spot speed in traffic Engineering?
(A) Endoscope (B) Radar (C) Periscope (D) Tachometer
61. Which of the following traffic survey schemes is not relevant when deciding on locating major Routes in a city?
(A) Traffic volume survey (B) O/D survey
(C) Speed survey (D) Traffic capacity survey
62. Radius of relative stiffness of cement concrete pavement does not depend upon which one of the following.
(A) Modulus of subgrade reaction
(B) Modulus of elasticity of cement concrete
(C) Wheel load
(D) Poisson's ration of concrete
63. Which one of the following is not a desirable property of the subgrade soil as highway materials?
(A) Stability (B) Good drainage
(C) Ease of compaction (D) Bitumen adhesion
64. The saturated and dry densities of a soil are 1.93g/cc and 1.47g/cc respectively. The porosity of the soil is
(A) 46 % (B) 60% (C) 30% (D) 10%

65. Primary consolidation in a fully saturated soil is due to
- (A) compression of soil solids (B) decrease in total stress
(C) compression of pore water (D) expulsion of water from voids
66. The appropriate triaxial test to assess the long term stability of an unloading problem, such as excavation of a clay slope would be the
- (A) unconsolidated undrained test (B) consolidated drained test
(C) consolidated undrained test (D) unconsolidated drained test
67. For all soils an increase in compactive effort causes optimum moisture content to
- (A) Increase (B) No change
(C) Decrease (D) No appreciable increase or decrease
68. Ultimate settlement of footings on cohesive soils is best estimated from
- (A) Plate load test (B) Consolidation test
(C) Cone penetration test (D) Standard penetration test
69. Uplift pressure beneath a foundation can be corrected by
- (A) pressure relief (B) direct resistance
(C) counter balancing (D) vertical sand drains
70. Vibration of machine foundation is often idealized as
- (A) Free vibration (B) Forced vibration with damping
(C) Forced vibration (D) Free vibration with damping
71. The first watering before sowing of the crop is known as
- (A) kor watering (B) paleo
(C) delta (D) none of the above
72. The field capacity of soil depends upon
- (A) Capillary tension in soil (B) Porosity of soil
(C) Either (A) or (B) (D) Both (A) and (B)
73. The total depth of water required by a crop during the entire period of the crop in the field, is known as
- (A) delta (B) duty
(C) base period (D) crop period

74. A parabolic glacis type fall is commonly known as
 (A) Montague fall (B) Inglis fall
 (C) Sarda fall (D) Vertical type fall
75. Escapes are also known as _____ for the canals
 (A) Outlet (B) Safety valves
 (C) Regulators (D) None of the above
76. When the drain is over the canal, the structure provided is known as
 (A) aqueduct (B) canal syphon
 (C) super - passage (D) syphon aqueduct
77. The bed of a canal is lowered in case of
 (A) Syphon aqueduct (B) Level Crossing
 (C) Canal syphon (D) All of the above
78. If the hinged end of a propped cantilever of span L settles by an amount δ then the rotation of the hinged end will be
 (A) δ/L (B) $2\delta/L$ (C) $1.5\delta/L$ (D) Zero
79. A uniform simply supported beam is subjected to a clockwise moment M at the left end. The moment required at the right end of the beam so that the rotation of right end is Zero is equal to
 (A) $2M$ (B) M (C) $M/2$ (D) $M/3$
80. Clockwise moment M are acting at both the ends of uniform simply supported beam. The ratio of slope at the end to the slope at centre will be
 (A) 0.5 (B) 1 (C) 2 (D) 3
81. The rotation of the free end of a cantilever beam due to a 5 kN load is 0.001 rad. Then the deflection of the free end due to a moment of 120 kN-m is
 (A) 1.2 mm (B) 2.4 mm (C) 3.6 mm (D) 4.8 mm
82. The total strain energy of a truss element is 500 joules and it carries an axial force of 100 kN. The extension of the member is
 (A) 1 mm (B) 2 mm (C) 5 mm (D) 10 mm
83. If a propped cantilever beam carrying a uniformly distributed load settles at the hinge support, the strain energy of this beam compared to the beam without settlement will be
 (A) More (B) Less (C) Equal (D) Less or equal

84. Strain energy stored in a rod of length L and axial rigidity AE due to an axial force P is
 (A) $P^2 L/AE$ (B) $P^2 L/2AE$ (C) $P^2 L/3AE$ (D) $P^2 L/4AE$
85. The principle of superposition states that the total deflection of a structure under different sets of loads is equal to the sum of deflections under each set of loads acting separately on the structure if the loads are within.
 (A) Limit state
 (B) Proportionality limit without buckling
 (C) Elastic limit
 (D) Elastic limit including buckling
86. Reason for steel to be considered as a good reinforcing material
 (A) High Tensile Strength (B) Cheap and readily available
 (C) High Modulus of Elasticity (D) All the above
87. Maximum Slenderness ratio of ties permissible in steel is
 (A) 250 (B) 350 (C) 450 (D) no limit
88. Steel member which is subjected to primary tension is called
 (A) Tie (B) Beam (C) Strut (D) Sling
89. The allowable direct tensile stress in structural steel is
 (A) $0.45 f_y$ (B) $0.6 f_y$ (C) $0.85 f_y$ (D) $0.75 f_y$
90. Maximum slenderness ratio of steel column subjected to dead and live loads is
 (A) 120 (B) 180 (C) 250 (D) 350
91. Effective length of a steel column fixed at both the ends is
 (A) $0.5L$ (B) $0.67L$ (C) L (D) $2L$
92. Most economical section for a steel column is
 (A) square (B) circular (C) tubular (D) hexagonal
93. Bearing stiffeners in plate girders are used to
 (A) decrease the effective depth of the web
 (B) prevent buckling of the web
 (C) transfer the load from top to bottom
 (D) increase the bearing capacity of the flange

94. Column bases of industrial buildings are mainly subjected to and designed for
(A) Bending, compression (B) Bearing, compression
(C) Compression, tension (D) Bearing, tension
95. The effective area of weld structural steel tie angle for design purpose is equal to
(A) gross area
(B) full area of welded plus 50% of outstanding leg
(C) full area of welded plus certain % of outstanding leg
(D) net area
96. The dry brick is usually expected to have moisture content of about
(A) 2 per cent (B) 6 percent
(C) 10 percent (D) 20 percent
97. Sandstones are generally weak in
(A) Hardness (B) Abrasion
(C) Compression (D) All of the above
98. The maximum percentage of ingredient in cement is that of
(A) Lime (B) Alumina
(C) Silica (D) Magnesium oxide
99. As the cement sets and hardens it generates heat. This is called
(A) Heat of vapourisation (B) Sensible heat
(C) Latent heat (D) Heat of hydration
100. Which proportion of cement mortar is used for plastering work?
(A) 1 : 2 (B) 1 : 3
(C) 1 : 5 (D) 1 : 7