Total No. of Printed Pages : 13

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A

SET-Y

M.Phil./Ph.D./URS-EE-2019

SUBJECT : Civil Engineering

Sr. No. 10037

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

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Mother's Name_____ Date of Examination_____

(Signature of the Candidate) (Signature of the Invigilator)

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SEAL

1. The transition curve used in the horizontal alignment of highways as per IRC recommendations is :
   (1) Spiral (2) lemniscate
   (3) Cubical parabola (4) any of the above

2. Bitumen of grade 80/100 means :
   (1) its penetration value is 8mm (2) its penetration value is 10mm
   (3) its penetration value is 8 to 10mm (4) its penetration value is 8 to 10cm

3. The alligator cracking in bituminous pavement is mainly due to :
   (1) inadequate wearing course
   (2) inadequate thickness of sub base course of pavement
   (3) use of excessive bituminous material
   (4) fatigue arising from repeated stress applications

4. In the Los Angeles Abrasion Test on aggregate, if the speed of the drum is increased to 50rpm, the abrasion value will :
   (1) Remain unchanged (2) be unpredictable
   (3) increase (4) decrease

5. When two roads with two lane, two way traffic cross at an uncontrolled intersection, the total number of major potential major conflict points would be :
   (1) 32 (2) 24 (3) 16 (4) 4

6. If a descending gradient of 1 in 25 meets an ascending gradient of 1 in 40, the length of valley curve required for head light distance of 100m will be :
   (1) 110m (2) 130m (3) 210m (4) 230m

7. For carrying out bituminous patch work during the rainy season, the most suitable binder is :
   (1) Road tar (2) Hot bitumen
   (3) Cutback bitumen (4) Bituminous emulsion

8. A vehicle was stopped in two seconds by fully jamming the brakes. The skid marks measured 9.8m. The average skid resistance coefficient will be :
   (1) 0.25 (2) 0.4 (3) 0.5 (4) 0.7

9. The general requirement in constructing a reinforced concrete road is to place a single layer of reinforcement :
   (1) Near the top of slab (2) Near the bottom of slab
   (3) At the middle of slab (4) Equally distributed at the top and bottom

10. A 30m chain is found to be 0 lm too short throughout the measurement. If the distance measured is recorded as 600m, the actual distance will be :
(1) 598m (2) 599m (3) 601m (4) 602m

11. It is required to produce a small scale map of an area in a magnetic zone by directly plotting and checking the work in the field itself. Which one of the following survey will be the most appropriate :
(1) Chain (2) Theodolite (3) Plane table (4) Compass

12. If in a triangle ABC b = 300m and angle ABC = 60°, then the radius of the circular curve passing through the points A, B and C will be :
(1) 86.60m (2) 100m (3) 126.60m (4) 173.20m

13. Which one of the following closely represents the shape of the earth ?
(1) Spheroid (2) Oblate spheroid
(3) Prolate spheroid (4) Ellipsoid

14. When the latitude is 56°15' N and declination is 17°30'S, the 'zenith distance' at the upper culmination of the star will be :
(1) 35°00' (2) 73°30'
(3) 73°45' (4) not determinable from the data given

15. If the cross sectional area of an embankment at 30m intervals are 20,40,60,50 and 30m^2, respectively, the volume of embankment on the basis of prismoidal rule, is :
(1) 5300m^3 (2) 8300m^3 (3) 9300m^3 (4) 9800m^3

16. The main plate of a transit is divided into 1080 equal divisions, 60 divisions of the vernier coincides exactly with 59 divisions of the main plate. The least count (in seconds) of the transit is :
(1) 5 (2) 10 (3) 15 (4) 20

17. A 3000m long line lying at an elevation of 450m measures 10cm on a vertical photograph. The focal length of the camera is 21 cm. The scale of the photograph for the area having an elevation of 1000m will be :
(1) 1:20606 (2) 1:25008 (3) 1:27381 (4) 1:30421

18. The minimum dissolved oxygen which should always be present in water in order to save the aquatic life is :
(1) 1ppm (2) 4ppm (3) 10ppm (4) 40ppm

19. Septic tank is a :
(a) settling tank (b) digestion tank (c) aeration tank
(1) only (a) (2) (a) and (b) (3) (a) and (c) (4) (b) and (c)

20. The maximum efficiency of BOD removal is achieved in :
(1) aerated lagoons
(2) oxidation pond
(3) oxidation ditch
(4) trickling filter

21. For the combined sewerage system, egg shaped sewers are preferred because :
(1) they offer good flow velocity during the dry weather flow condition
(2) they are structurally more stable
(3) their maintenance is easier
(4) they are economical

22. Various units in a sewerage treatment are :
(a) screening
(b) grit removal
(c) secondary sedimentation
(d) aeration
(e) primary sedimentation
Their ***correct*** order of placement will be :
(1) b, a, d, e and c (2) b, a, d, c and e (3) a, b, c, d and e (4) a, b, e, c and d

23. One litre of sewage, when allowed to settle for 30 minutes gives a sludge volume $27cm^3$. If the dry weight of this sludge is 3.0 grams, the sludge volume index will be :
(1) 100 (2) 81 (3) 24 (4) 9

24. Electrical conductivity of water and total dissolved solids (TDS) are interrelated. The value of electrical conductivity will :
(1) increase initially and then decrease with increase in TDS
(2) decrease initially and then increase with the increase in TDS
(3) increase with the increase in TDS
(4) decrease with the increase in TDS

25. Coal based thermal power stations pollute the atmosphere by adding :
(1) NO_x and SO_2
(2) NO_x, SO_2 and SPM
(3) NO_x, S02, SPM and CO
(4) NO_x, SO_2, and CO

26. Zero hardness of water is achieved by :
(1) Using lime soda process
(2) Excess lime treatment
(3) Ion exchange method
(4) Using excess alum dosage

27. In a water treatment plant, dissolved iron and manganese can be removed from water by 6K :
(1) aeration
(2) aeration and flocculation
(3) aeration and coagulation
(4) aeration and sedimentation

28. What is the correct sequence of formation of the following compounds during chlorination of water in which ammonia is present ?
(a) NCl_3 (b) NH_2Cl (c) $NHCl_2$
Correct order is :
(1) a, b and c (2) b, a and c (3) c, a and b (4) c, b and a

29. Consider the following activities of a housing project :
(a) Flooring
(b) Wall plastering
(c) Conceal wiring
(d) Fixing door window frames
(e) Fixing door window shutters
The ***correct*** logical sequence of above activities will be
(1) a, b, c, d and e
(2) e, d, c, b and a
(3) d, c, b, e and a
(4) b, c, d, e and a

30. There are four consecutive activities in a simple linear network, each with mean duration of T and each with 'k' as the standard deviation of its duration. The overall project duration through these activities is likely to be in the range :
(1) $4T \pm 6K$ (2) $4T \pm 4K$ (3) $4T \pm 2k$ (4) $4T \pm k$

31. lack time is associated with :
(1) Dummy activity
(2) A real activity
(3) An event
(4) Both event and real activity

32. In PERT analysis, the time estimates of activities and probability of their occurrence follow :
(1) Normal distribution curve
(2) Bionomial distribution curve
(3) Poisson's distribution curve
(4) β-distribution curve

33. What is the time by which the completion of an activity can be delayed without affecting the start of succeeding activities called ?
(1) Free float
(2) Interfering float
(3) Independent float
(4) Total float

34. Which one of the following is NOT an excavating and moving type equipment ?
(1) Bulldozer (2) Dump truck (3) Clamshell (4) Scraper

35. Match **LIST-I** with **LIST-II** and select the correct answer using the codes given below in the lists :

LIST-I	**LIST-II**
(a) Cube specimen	(i) Pin Vibrator
(b) Pavement slab	(ii) Form Vibrator
(c) Heavily reinforced column	(iii) Table Vibrator
(d) Mass concrete in bridge piers	(iv) Screed Vibrator
	(v) Manual compaction

Select the ***correct*** answer :

	(a)	(b)	(c)	(d)
(1)	iv	iii	ii	i
(2)	iii	iv	ii	i
(3)	ii	iii	iv	v
(4)	iii	iv	i	v

36. The function of coping is to serve as a :
(1) Shade against solar radiation
(2) Projection from a wall to support a structural member
(3) Ornamental course between lintel and roof level
(4) Covering to the wall to throw off water

37. For marine works, which of the following cement is best suited ?
(1) Ordinary Portland cement (2) Rapid Hardening cement
(3) Blast furnace slag cement (4) Low heat Portland cement

38. Consider the following statements.
Cement mortars richer than 1:3 are not used in masonry work because :
(a) There is no gain in strength of masonry
(b) There is high shrinkage
(c) They are prone to segregation

Which of these statements are ***correct*** :
(1) (a), (b) and (c) (2) (b) and (c) (3) (a) and (c) (4) (a) and (b)

39. Slump and compaction factors are two different measures of workability of concrete. For a slump of 0 to 20mm, what is the equivalent range of compaction factor ?
(1) 0.70-0.80 (2) 0.80 - 0.85 (3) 0.85 - 0.90 (4) 0.90-0.95

40. The fineness modulus of fine aggregate is 2.78 and of coarse aggregate is 7.82 and the desired fineness modulus of mixed aggregate is 6.14. What is the amount of fine aggregate to be mixed with one part of coarse aggregate ?
(1) 55% (2) 50% (3) 45% (4) 40%

41. Modular bricks are of nominal size 20 × 10 × 10 cm and 20% of the volume is lost in mortar between joints. What is the number of modular bricks required per cubic metre of brickwork ?
(1) 520 (2) 500 (3) 485 (4) 470

42. As per Indian Standards, the minimum compressive strength of a first class brick should be
(1) 75kg/cm^2 (2) 90kg/cm^2 (3) 100kg/cm^2 (4) 125kg/cm^2

43. The nail diameter should not be more than (t=least thickness of the wooden member to be connected) :
(1) t/6 (2) t/8 (3) t/10 (4) t/12

44. The moisture content in a structural timber should be :
(1) 15-25% (2) 10-20% (3) 5-10% (4) less than 5%

45. The carbon content of structural steel is :
(1) 0.75-1.00% (2) 0.50-0.75% (3) 0.25-0.50% (4) 0.10-0.25%

46. Which one of the following types of steel is used in the manufacture of rails ?
(1) Mild steel (2) Cast steel
(3) Manganese steel (4) Bessemer steel

47. For sand of uniform spherical particles, the ratio of void ratios in the loosest and the densest states is :
(1) 3.0 (2) 2.6 (3) 2.0 (4) 1.5

48. The correct order of increasing surface area of the soil is :
(1) sand, silt, clay and colloids (2) sand, silt, colloids and clay
(3) silt, sand, clay, and colloids (4) clay, silt, sand and colloids

49. Which one of the following statements provides the best argument that direct shear tests are not suited for determining shear parameters of a clayey soil ?
(1) Failure plane is not the weakest plane
(2) Satisfactory strain levels cannot be maintained
(3) Pore pressures developed cannot be measured
(4) Adequate consolidation cannot be ensured

50. The upstream slope of an earth dam under steady seepage condition is :
(1) phreatic line (2) flow line
(3) seepage line (4) equipotential line

51. Undisturbed soil samples are required to conduct :
(1) Hydrometer test (2) consolidation test
(3) Shrinkage limit test (4) specific gravity test

52. When the degree of consolidation is 50%, the time factor is about :
(1) 0.2 (2) 0.5 (3) 1.0 (4) 2.0

53. Which one of the following, gives the correct decreasing order of the densities of a soil sample ?
(1) saturated, submerged, wet, dry (2) saturated, wet, submerged, dry
(3) saturated, wet, dry, submerged (4) dry, wet, submerged, saturated

54. Consider the following types of soil tests :
(a) California bearing ratio
(b) Consolidation
(c) Unconfined Compression
The soil tests required to be done in the case undisturbed samples include :
(1) a, b and C (2) a and b (3) a and c (4) b and c

55. The direction of seepage during seepage through an earth mass is :
(1) Along the direction of gravity
(2) Parallel to equipotential lines
(3) Perpendicular to the equipotential lines
(4) Perpendicular to stream lines

56. The difference between maximum void ratio and minimum void ratio of a sand sample is 0.30. If the relative density of this sample is 66.60% at a void ratio of 0.40, the void ratio of this sample at its loosest state will be :
(1) 0.40 (2) 0.60 (3) 0.70 (4) 0.75

57. Which one of the following parameters can be used to estimate the angle of internal friction of a sandy soil ?
(1) density index (2) particle size
(3) roughness of particle (4) particle size distribution

58. The limit of the values of the coefficient of discharge of venturimeter is between :
(1) 0.60-0.75 (2) 0.76-0.80 (3) 0.81-0.94 (4) 0.95-0.99

59. Consider the following fluids :
(a) Blood
(b) Glycerine
(c) Molasses
(d) Slurry of clay in water
(e) Kerosene

Among the above, non-Newtonian fluids will include :
(1) b, d and e (2) b, d and c (3) a, c and d (4) a, d and e

60. Which one of the following statement is NOT correct ?
(1) Specific energy is the total energy above the floor of an open channel
(2) For a given specific energy, two depths exist and these are called alternate depth
(3) Critical velocity occurs at Froude number = 1
(4) Velocity of flow is critical at maximum specific energy

61. A racing car with partially filled fuel tank moves in the horizontal direction at a uniform acceleration equal to 'g'. The free surface of the liquid fuel in the tank will assume a slope of :
(1) 45° (2) 30° (3) 25° (4) 15°

62. Which one of the following statement is NOT correct ?
(1) For water hammer to develop, the valve at the end of a pipeline must be fully closed
(2) Fall of pressure due to decrease in velocity results in the phenomenon of water hammer
(3) Water hammer occurs in a situation when there is unsteady flow in a pipe
(4) Propagation of high pressure through elastic media gives rise to water hammer

63. A 4 hour rainfall in a catchment of 250km^2 produces rainfall depth of 6.2cm and 5.0cm in successive 2 hour unit periods. Assuming the Φ index of soil to be 1.2 cm/hr, the run off volume in ha-m will be :
(1) 22 (2) 2200
(3) 16 (4) 1600

64. A channel designed by Lacey's theory has a mean velocity of one m/s. The silt factor is unity. The hydraulic mean radius will be :
(1) 2.5m (2) 2m
(3) 1m (4) 0.5m

65. A pumped storage plant is a :
(1) High head plant (2) Run-off river plant
(3) Peak load plant (4) Base load plant

66. Probability of a 10 year flood to occur at least once in the next 4 years is :
(1) 25% (2) 35% (3) 50% (4) 60%

67. A motor shaft rotating with a speed of 90rpm decelerates uniformly when the motor is switched off and stops in 40sec. The number of revolutions made by the shaft in this would be :
(1) 10 (2) 20 (3) 30 (4) 40

68. In a particular material, if the modulus of rigidity is equal to the bulk modulus, the Poisson's coefficient will be :
(1) 1 (2) 0.50 (3) 0.25 (4) 0.125

69. Strain energy in a member is :
(1) Directly proportional to strains
(2) Directly proportional to changes in strains
(3) A function of strains as well as stresses
(4) A function of loads only

70. The 'Euler's load' for a column is 1000kN and crushing load is 1500kN. The Rankine's load is equal to :
(1) 600kN (2) 1000kN (3) 1500kN (4) 2500kN

71. A beam of length 10m carries a udl of 20kN/m over its entire length and rests on two simple supports. In order that the maximum bending moment produced in the beam is the least possible, the supports must be placed from the ends at a distance of :
(1) 1.75m (2) 2.07m (3) 4.14m (4) 5.86m

72. Which one of the following pairs is not correctly matched ?
(1) Lame's constants : Thick cylinder
(2) Macaulay's Method : Deflection of beam
(3) Euler's load : Theory of column
(4) Eddy's theorem : Torsion of shafts

73. The ratio of the flexural strengths of two beams square cross section, the first beam being placed with its top and bottom sides horizontally and the second beam being placed with one diagonal horizontally is :
(1) $\sqrt{2}$ (2) $1\sqrt{2}$ (3) $\sqrt{3}$ (4) $1\sqrt{3}$

74. In a two hinged arch an increase in temperature induces :
(1) no bending moment in the arch rib
(2) uniform bending moment in the arch rib
(3) maximum bending moment at the crown
(4) minimum bending moment at the crown

75. The absolute maximum bending moment in a simply supported beam of span 20m due to moving udl of 4kN/m spanning over 5m is :
(1) 87.5kNm at the support
(2) 87.5kNm at the mid point
(3) 75kNm at the support
(4) 75kNm at the mid point

76. A beam AB is fixed at both ends and carries a udl over its entire length. Due to some construction defects, the end B is now reduced to a simple support. The percentage increase in bending moment at A is :
(1) 100 (2) 85 (3) 75 (4) 50

77. A cantilever beam AB fixed at A and carrying a load W at the free end is found to deflect by δ at the mid point of AB. The deflection of B due to a load W/2 at the mid point will be :
(1) $\delta/4$ (2) $\delta/2$ (3) δ (4) 2δ

78. If the axial deformation is neglected, what is the kinematic indeterminacy of a single bay portal frame at base :
(1) 3 (2) 4 (3) 5 (4) 6

79. The moment distribution method in structural analysis falls in the category of :
(1) Force method
(2) Displacement method
(3) First order approximate method
(4) Flexibility method

80. A propped cantilever beam AB of span L is subjected to a moment M at the prop end B. The moment at the fixed end A is :
(1) 2M (2) M (3) 3M/4 (4) M/2

81. The permissible stresses in rivets under wind load conditions as per IS:800 can be exceeded by about :
(1) 50% (2) 33% (3) 25% (4) 10%

82. The type of stresses induced in the foundation bolts fixing a column to its footing is :
(1) pure tension
(2) pure compression
(3) bearing
(4) bending

83. Steel structures are ideally suitable for impact loads because they have high :
(1) plastic modulus (2) elastic modulus
(3) design stress (4) toughness value

84. When the load line coincides with the centroid of the rivet group, the rivets are subjected to :
(1) Tension only (2) Shear only
(3) Bending only (4) Shear as well as tension

85. Steel of yield strength 400MPa has been used in a structure. What is the value of the maximum allowable tensile strength :
(1) 96MPa (2) 120MPa (3) 240MPa (4) 400MPa

86. The slenderness ratio of lacing bars should not exceed :
(1) 145 (2) 120 (3) 100 (4) 75

87. How are the most commonly produced and used structural elements in frames, floors, beams, etc with high moment of inertia about x-axis designated ?
(1) ISWB-section (2) ISLB-section (3) ISMB-section (4) ISHB-section

88. Consider the following statements in respect of design of web and flange splices :
(a) Flange splice shall be designed for actual bending moment at the section
(b) Flange splice shall be designed for actual shear at the section
(c) Web splice shall be designed for actual bending moment at the section
(d) Web splice shall be designed for actual shear at the section
Choose the ***correct*** statement :
(1) a and c (2) b and c (3) a and b (4) a and d

89. If the shape factor of a section is 1.5 and the factor of safety to be adopted is 2, the load factor will be :
(1) 2 (2) 3 (3) 4 (4) 1.5

90. In a plastic analysis of structures, the segment between any two successive plastic hinges is assumed to deform as :
(1) A plastic material (2) As elastic material
(3) As rigid material (4) As inelastic material

91. The final deflection due to all loads including the effects of temperature, creep, and shrinkage and measured from the cast level of supports of floors, roofs, and all other horizontal members should NOT exceed :
(1) Span/250 (2) Span/300 (3) Span/350 (4) Span/400

92. In the limit state method of design, the failure criterion for reinforced concrete beams and columns is :
(1) Maximum shear stress theory (2) Maximum strain energy theory
(3) Distortion energy theory (4) Maximum principal strain theory

93. What should be the minimum grade of concrete in and around sea coast construction as per IS:456 ?
(1) M20 (2) M25 (3) M30 (4) M35

94. A reinforced concrete beam of span 4m has a cross section 150mm × 500mm. If checked for lateral stability and deflection, the beam will :
(1) Fail in both deflection and lateral stability
(2) Fail in lateral stability only
(3) Fail in deflection only
(4) Satisfies the requirements of lateral stability and deflection

95. If b = width, d = effective depth and D = overall depth, the maximum area of compressive reinforcement in a beam is :
(1) 0.04bd (2) 0.04bD (3) 0.12bd (4) 0.12bD

96. How does the bond stress acts on longitudinal reinforcement in a beam on the interface of bar and concrete ?
(1) compressive stress (2) tensile stress
(3) bearing stress (4) shear stress

97. Lap length of reinforcement in compression shall not be less than :
(1) 15Φ (2) 20Φ (3) 24Φ (4) 30Φ

98. The load carrying capacity of a column designed by working stress method is 1000kN. The collapse load of the column is :
(1) 662.5kN (2) 1000kN (3) 1250kN (4) 1500kN

99. Minimum clear covers to the main steel bars (in mm), in slab, beam, column and footing, respectively are :
(1) 15, 25, 40 and 75mm (2) 10, 15, 20 and 25mm
(3) 20, 25, 30 and 50mm (4) 20, 25, 35 and 70mm

100. For prestressed structural elements, high strength concrete is used primarily because :
(1) Modulus of elasticity and creep values are higher
(2) Higher modulus of elasticity and low creep
(3) Shrinkage is less but creep values are higher
(4) Both creep and shrinkage are more

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1. Modular bricks are of nominal size 20 × 10 × 10 cm and 20% of the volume is lost in mortar between joints. What is the number of modular bricks required per cubic metre of brickwork ?
   (1) 520 (2) 500 (3) 485 (4) 470

2. As per Indian Standards, the minimum compressive strength of a first class brick should be
   (1) 75kg/cm^2 (2) 90kg/cm^2 (3) 100kg/cm^2 (4) 125kg/cm^2

3. The nail diameter should not be more than (t=least thickness of the wooden member to be connected) :
   (1) t/6 (2) t/8 (3) t/10 (4) t/12

4. The moisture content in a structural timber should be :
   (1) 15-25% (2) 10-20% (3) 5-10% (4) less than 5%

5. The carbon content of structural steel is :
   (1) 0.75-1.00% (2) 0.50-0.75% (3) 0.25-0.50% (4) 0.10-0.25%

6. Which one of the following types of steel is used in the manufacture of rails ?
   (1) Mild steel (2) Cast steel
   (3) Manganese steel (4) Bessemer steel

7. For sand of uniform spherical particles, the ratio of void ratios in the loosest and the densest states is :
   (1) 3.0 (2) 2.6 (3) 2.0 (4) 1.5

8. The correct order of increasing surface area of the soil is :
   (1) sand, silt, clay and colloids (2) sand, silt, colloids and clay
   (3) silt, sand, clay, and colloids (4) clay, silt, sand and colloids

9. Which one of the following statements provides the best argument that direct shear tests are not suited for determining shear parameters of a clayey soil ?
   (1) Failure plane is not the weakest plane
   (2) Satisfactory strain levels cannot be maintained
   (3) Pore pressures developed cannot be measured
   (4) Adequate consolidation cannot be ensured

10. The upstream slope of an earth dam under steady seepage condition is :
    (1) phreatic line (2) flow line
    (3) seepage line (4) equipotential line

11. A beam of length 10m carries a udl of 20kN/m over its entire length and rests on two simple supports. In order that the maximum bending moment produced in the beam is the least possible, the supports must be placed from the ends at a distance of :
(1) 1.75m (2) 2.07m (3) 4.14m (4) 5.86m

12. Which one of the following pairs is not correctly matched ?
(1) Lame's constants : Thick cylinder
(2) Macaulay's Method : Deflection of beam
(3) Euler's load : Theory of column
(4) Eddy's theorem : Torsion of shafts

13. The ratio of the flexural strengths of two beams square cross section, the first beam being placed with its top and bottom sides horizontally and the second beam being placed with one diagonal horizontally is :
(1) $\sqrt{2}$ (2) $1\sqrt{2}$ (3) $\sqrt{3}$ (4) $1\sqrt{3}$

14. In a two hinged arch an increase in temperature induces :
(1) no bending moment in the arch rib
(2) uniform bending moment in the arch rib
(3) maximum bending moment at the crown
(4) minimum bending moment at the crown

15. The absolute maximum bending moment in a simply supported beam of span 20m due to moving udl of 4kN/m spanning over 5m is :
(1) 87.5kNm at the support (2) 87.5kNm at the mid point
(3) 75kNm at the support (4) 75kNm at the mid point

16. A beam AB is fixed at both ends and carries a udl over its entire length. Due to some construction defects, the end B is now reduced to a simple support. The percentage increase in bending moment at A is :
(1) 100 (2) 85 (3) 75 (4) 50

17. A cantilever beam AB fixed at A and carrying a load W at the free end is found to deflect by δ at the mid point of AB. The deflection of B due to a load W/2 at the mid point will be :
(1) $\delta/4$ (2) $\delta/2$ (3) δ (4) 2δ

18. If the axial deformation is neglected, what is the kinematic indeterminacy of a single bay portal frame at base :
(1) 3 (2) 4 (3) 5 (4) 6

19. The moment distribution method in structural analysis falls in the category of :
(1) Force method (2) Displacement method
(3) First order approximate method (4) Flexibility method

20. A propped cantilever beam AB of span L is subjected to a moment M at the prop end B. The moment at the fixed end A is :
(1) 2M (2) M (3) 3M/4 (4) M/2

21. The final deflection due to all loads including the effects of temperature, creep, and shrinkage and measured from the cast level of supports of floors, roofs, and all other horizontal members should NOT exceed :
(1) Span/250 (2) Span/300 (3) Span/350 (4) Span/400

22. In the limit state method of design, the failure criterion for reinforced concrete beams and columns is :
(1) Maximum shear stress theory (2) Maximum strain energy theory
(3) Distortion energy theory (4) Maximum principal strain theory

23. What should be the minimum grade of concrete in and around sea coast construction as per IS:456 ?
(1) M20 (2) M25 (3) M30 (4) M35

24. A reinforced concrete beam of span 4m has a cross section 150mm × 500mm. If checked for lateral stability and deflection, the beam will :
(1) Fail in both deflection and lateral stability
(2) Fail in lateral stability only
(3) Fail in deflection only
(4) Satisfies the requirements of lateral stability and deflection

25. If b = width, d = effective depth and D = overall depth, the maximum area of compressive reinforcement in a beam is :
(1) 0.04bd (2) 0.04bD (3) 0.12bd (4) 0.12bD

26. How does the bond stress acts on longitudinal reinforcement in a beam on the interface of bar and concrete ?
(1) compressive stress (2) tensile stress
(3) bearing stress (4) shear stress

27. Lap length of reinforcement in compression shall not be less than :
(1) 15Φ (2) 20Φ (3) 24Φ (4) 30Φ

28. The load carrying capacity of a column designed by working stress method is 1000kN. The collapse load of the column is :
(1) 662.5kN (2) 1000kN (3) 1250kN (4) 1500kN

29. Minimum clear covers to the main steel bars (in mm), in slab, beam, column and footing, respectively are :
(1) 15, 25, 40 and 75mm
(2) 10, 15, 20 and 25mm
(3) 20, 25, 30 and 50mm
(4) 20, 25, 35 and 70mm

30. For prestressed structural elements, high strength concrete is used primarily because :
(1) Modulus of elasticity and creep values are higher
(2) Higher modulus of elasticity and low creep
(3) Shrinkage is less but creep values are higher
(4) Both creep and shrinkage are more

31. The transition curve used in the horizontal alignment of highways as per IRC recommendations is :
(1) Spiral
(2) lemniscate
(3) Cubical parabola
(4) any of the above

32. Bitumen of grade 80/100 means :
(1) its penetration value is 8mm
(2) its penetration value is 10mm
(3) its penetration value is 8 to 10mm
(4) its penetration value is 8 to 10cm

33. The alligator cracking in bituminous pavement is mainly due to :
(1) inadequate wearing course
(2) inadequate thickness of sub base course of pavement
(3) use of excessive bituminous material
(4) fatigue arising from repeated stress applications

34. In the Los Angeles Abrasion Test on aggregate, if the speed of the drum is increased to 50rpm, the abrasion value will :
(1) Remain unchanged
(2) be unpredictable
(3) increase
(4) decrease

35. When two roads with two lane, two way traffic cross at an uncontrolled intersection, the total number of major potential major conflict points would be :
(1) 32 (2) 24 (3) 16 (4) 4

36. If a descending gradient of 1 in 25 meets an ascending gradient of 1 in 40, the length of valley curve required for head light distance of 100m will be :
(1) 110m (2) 130m (3) 210m (4) 230m

37. For carrying out bituminous patch work during the rainy season, the most suitable binder is :

(1) Road tar (2) Hot bitumen

(3) Cutback bitumen (4) Bituminous emulsion

38. A vehicle was stopped in two seconds by fully jamming the brakes. The skid marks measured 9.8m. The average skid resistance coefficient will be :

(1) 0.25 (2) 0.4 (3) 0.5 (4) 0.7

39. The general requirement in constructing a reinforced concrete road is to place a single layer of reinforcement :

(1) Near the top of slab (2) Near the bottom of slab

(3) At the middle of slab (4) Equally distributed at the top and bottom

40. A 30m chain is found to be 0 lm too short throughout the measurement. If the distance measured is recorded as 600m, the actual distance will be :

(1) 598m (2) 599m (3) 601m (4) 602m

41. Undisturbed soil samples are required to conduct :

(1) Hydrometer test (2) consolidation test

(3) Shrinkage limit test (4) specific gravity test

42. When the degree of consolidation is 50%, the time factor is about :

(1) 0.2 (2) 0.5 (3) 1.0 (4) 2.0

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

(1) saturated, submerged, wet, dry (2) saturated, wet, submerged, dry

(3) saturated, wet, dry, submerged (4) dry, wet, submerged, saturated

44. Consider the following types of soil tests :

(a) California bearing ratio

(b) Consolidation

(c) Unconfined Compression

The soil tests required to be done in the case undisturbed samples include :

(1) a, b and C (2) a and b (3) a and c (4) b and c

45. The direction of seepage during seepage through an earth mass is :
(1) Along the direction of gravity
(2) Parallel to equipotential lines
(3) Perpendicular to the equipotential lines
(4) Perpendicular to stream lines

46. The difference between maximum void ratio and minimum void ratio of a sand sample is 0.30. If the relative density of this sample is 66.60% at a void ratio of 0.40, the void ratio of this sample at its loosest state will be :
(1) 0.40 (2) 0.60 (3) 0.70 (4) 0.75

47. Which one of the following parameters can be used to estimate the angle of internal friction of a sandy soil ?
(1) density index (2) particle size
(3) roughness of particle (4) particle size distribution

48. The limit of the values of the coefficient of discharge of venturimeter is between :
(1) 0.60-0.75 (2) 0.76-0.80 (3) 0.81-0.94 (4) 0.95-0.99

49. Consider the following fluids :
(a) Blood (b) Glycerine
(c) Molasses (d) Slurry of clay in water
(e) Kerosene

Among the above, non-Newtonian fluids will include :
(1) b, d and e (2) b, d and c (3) a, c and d (4) a, d and e

50. Which one of the following statement is NOT correct ?
(1) Specific energy is the total energy above the floor of an open channel
(2) For a given specific energy, two depths exist and these are called alternate depth
(3) Critical velocity occurs at Froude number = 1
(4) Velocity of flow is critical at maximum specific energy

51. A racing car with partially filled fuel tank moves in the horizontal direction at a uniform acceleration equal to 'g'. The free surface of the liquid fuel in the tank will assume a slope of :
(1) 45° (2) 30° (3) 25° (4) 15°

52. Which one of the following statement is NOT correct ?
(1) For water hammer to develop, the valve at the end of a pipeline must be fully closed
(2) Fall of pressure due to decrease in velocity results in the phenomenon of water hammer
(3) Water hammer occurs in a situation when there is unsteady flow in a pipe
(4) Propagation of high pressure through elastic media gives rise to water hammer

53. A 4 hour rainfall in a catchment of 250km^2 produces rainfall depth of 6.2cm and 5.0cm in successive 2 hour unit periods. Assuming the Φ index of soil to be 1.2 cm/hr, the run off volume in ha-m will be :
(1) 22 (2) 2200
(3) 16 (4) 1600

54. A channel designed by Lacey's theory has a mean velocity of one m/s. The silt factor is unity. The hydraulic mean radius will be :
(1) 2.5m (2) 2m
(3) 1m (4) 0.5m

55. A pumped storage plant is a :
(1) High head plant (2) Run-off river plant
(3) Peak load plant (4) Base load plant

56. Probability of a 10 year flood to occur at least once in the next 4 years is :
(1) 25% (2) 35% (3) 50% (4) 60%

57. A motor shaft rotating with a speed of 90rpm decelerates uniformly when the motor is switched off and stops in 40sec. The number of revolutions made by the shaft in this would be :
(1) 10 (2) 20 (3) 30 (4) 40

58. In a particular material, if the modulus of rigidity is equal to the bulk modulus, the Poisson's coefficient will be :
(1) 1 (2) 0.50 (3) 0.25 (4) 0.125

59. Strain energy in a member is :
(1) Directly proportional to strains
(2) Directly proportional to changes in strains
(3) A function of strains as well as stresses
(4) A function of loads only

60. The 'Euler's load' for a column is 1000kN and crushing load is 1500kN. The Rankine's load is equal to :
(1) 600kN (2) 1000kN (3) 1500kN (4) 2500kN

61. For the combined sewerage system, egg shaped sewers are preferred because :
(1) they offer good flow velocity during the dry weather flow condition
(2) they are structurally more stable
(3) their maintenance is easier
(4) they are economical

62. Various units in a sewerage treatment are :
(a) screening
(b) grit removal
(c) secondary sedimentation
(d) aeration
(e) primary sedimentation
Their ***correct*** order of placement will be :
(1) b, a, d, e and c (2) b, a, d, c and e (3) a, b, c, d and e (4) a, b, e, c and d

63. One litre of sewage, when allowed to settle for 30 minutes gives a sludge volume 27cm^3. If the dry weight of this sludge is 3.0 grams, the sludge volume index will be :
(1) 100 (2) 81 (3) 24 (4) 9

64. Electrical conductivity of water and total dissolved solids (TDS) are interrelated. The value of electrical conductivity will :
(1) increase initially and then decrease with increase in TDS
(2) decrease initially and then increase with the increase in TDS
(3) increase with the increase in TDS
(4) decrease with the increase in TDS

65. Coal based thermal power stations pollute the atmosphere by adding :
(1) NO_x and SO_2 (2) NO_x, SO_2 and SPM
(3) NO_x, S02, SPM and CO (4) NO_x, SO_2, and CO

66. Zero hardness of water is achieved by :
(1) Using lime soda process
(2) Excess lime treatment
(3) Ion exchange method
(4) Using excess alum dosage

67. In a water treatment plant, dissolved iron and manganese can be removed from water by 6K :

(1) aeration
(2) aeration and flocculation
(3) aeration and coagulation
(4) aeration and sedimentation

68. What is the correct sequence of formation of the following compounds during chlorination of water in which ammonia is present ?

(a) NCl_3 (b) NH_2Cl (c) $NHCl_2$

Correct order is :

(1) a, b and c (2) b, a and c (3) c, a and b (4) c, b and a

69. Consider the following activities of a housing project :

(a) Flooring
(b) Wall plastering
(c) Conceal wiring
(d) Fixing door window frames
(e) Fixing door window shutters

The ***correct*** logical sequence of above activities will be

(1) a, b, c, d and e
(2) e, d, c, b and a
(3) d, c, b, e and a
(4) b, c, d, e and a

70. There are four consecutive activities in a simple linear network, each with mean duration of T and each with 'k' as the standard deviation of its duration. The overall project duration through these activities is likely to be in the range :

(1) $4T \pm 6K$ (2) $4T \pm 4K$ (3) $4T \pm 2k$ (4) $4T \pm k$

71. It is required to produce a small scale map of an area in a magnetic zone by directly plotting and checking the work in the field itself. Which one of the following survey will be the most appropriate :

(1) Chain (2) Theodolite (3) Plane table (4) Compass

72. If in a triangle ABC b = 300m and angle ABC = 60°, then the radius of the circular curve passing through the points A, B and C will be :

(1) 86.60m (2) 100m (3) 126.60m (4) 173.20m

73. Which one of the following closely represents the shape of the earth ?

(1) Spheroid
(2) Oblate spheroid
(3) Prolate spheroid
(4) Ellipsoid

74. When the latitude is 56°15' N and declination is 17°30'S, the 'zenith distance' at the upper culmination of the star will be :

(1) 35°00'
(2) 73°30'
(3) 73°45'
(4) not determinable from the data given

75. If the cross sectional area of an embankment at 30m intervals are 20,40,60,50 and $30m^2$, respectively, the volume of embankment on the basis of prismoidal rule, is :

(1) $5300m^3$ (2) $8300m^3$ (3) $9300m^3$ (4) $9800m^3$

76. The main plate of a transit is divided into 1080 equal divisions, 60 divisions of the vernier coincides exactly with 59 divisions of the main plate. The least count (in seconds) of the transit is :

(1) 5 (2) 10 (3) 15 (4) 20

77. A 3000m long line lying at an elevation of 450m measures 10cm on a vertical photograph. The focal length of the camera is 21 cm. The scale of the photograph for the area having an elevation of 1000m will be :

(1) 1:20606 (2) 1:25008 (3) 1:27381 (4) 1:30421

78. The minimum dissolved oxygen which should always be present in water in order to save the aquatic life is :

(1) 1ppm (2) 4ppm (3) 10ppm (4) 40ppm

79. Septic tank is a :

(a) settling tank (b) digestion tank (c) aeration tank

(1) only (a) (2) (a) and (b) (3) (a) and (c) (4) (b) and (c)

80. The maximum efficiency of BOD removal is achieved in :

(1) aerated lagoons (2) oxidation pond

(3) oxidation ditch (4) trickling filter

81. The permissible stresses in rivets under wind load conditions as per IS:800 can be exceeded by about :

(1) 50% (2) 33% (3) 25% (4) 10%

82. The type of stresses induced in the foundation bolts fixing a column to its footing is :

(1) pure tension (2) pure compression

(3) bearing (4) bending

83. Steel structures are ideally suitable for impact loads because they have high :

(1) plastic modulus (2) elastic modulus

(3) design stress (4) toughness value

84. When the load line coincides with the centroid of the rivet group, the rivets are subjected to :

(1) Tension only (2) Shear only

(3) Bending only (4) Shear as well as tension

85. Steel of yield strength 400MPa has been used in a structure. What is the value of the maximum allowable tensile strength :
(1) 96MPa (2) 120MPa (3) 240MPa (4) 400MPa

86. The slenderness ratio of lacing bars should not exceed :
(1) 145 (2) 120 (3) 100 (4) 75

87. How are the most commonly produced and used structural elements in frames, floors, beams, etc with high moment of inertia about x-axis designated ?
(1) ISWB-section (2) ISLB-section (3) ISMB-section (4) ISHB-section

88. Consider the following statements in respect of design of web and flange splices :
(a) Flange splice shall be designed for actual bending moment at the section
(b) Flange splice shall be designed for actual shear at the section
(c) Web splice shall be designed for actual bending moment at the section
(d) Web splice shall be designed for actual shear at the section
Choose the ***correct*** statement :
(1) a and c (2) b and c (3) a and b (4) a and d

89. If the shape factor of a section is 1.5 and the factor of safety to be adopted is 2, the load factor will be :
(1) 2 (2) 3 (3) 4 (4) 1.5

90. In a plastic analysis of structures, the segment between any two successive plastic hinges is assumed to deform as :
(1) A plastic material (2) As elastic material
(3) As rigid material (4) As inelastic material

91. lack time is associated with :
(1) Dummy activity (2) A real activity
(3) An event (4) Both event and real activity

92. In PERT analysis, the time estimates of activities and probability of their occurrence follow :
(1) Normal distribution curve (2) Bionomial distribution curve
(3) Poisson's distribution curve (4) β-distribution curve

93. What is the time by which the completion of an activity can be delayed without affecting the start of succeeding activities called ?
(1) Free float (2) Interfering float
(3) Independent float (4) Total float

94. Which one of the following is NOT an excavating and moving type equipment ?
(1) Bulldozer (2) Dump truck (3) Clamshell (4) Scraper

95. Match **LIST-I** with **LIST-II** and select the correct answer using the codes given below in the lists :

LIST-I	**LIST-II**
(a) Cube specimen	(i) Pin Vibrator
(b) Pavement slab	(ii) Form Vibrator
(c) Heavily reinforced column	(iii) Table Vibrator
(d) Mass concrete in bridge piers	(iv) Screed Vibrator
	(v) Manual compaction

Select the ***correct*** answer :

	(a)	(b)	(c)	(d)
(1)	iv	iii	ii	i
(2)	iii	iv	ii	i
(3)	ii	iii	iv	v
(4)	iii	iv	i	v

96. The function of coping is to serve as a :

(1) Shade against solar radiation
(2) Projection from a wall to support a structural member
(3) Ornamental course between lintel and roof level
(4) Covering to the wall to throw off water

97. For marine works, which of the following cement is best suited ?

(1) Ordinary Portland cement (2) Rapid Hardening cement
(3) Blast furnace slag cement (4) Low heat Portland cement

98. Consider the following statements.
Cement mortars richer than 1:3 are not used in masonry work because :

(a) There is no gain in strength of masonry
(b) There is high shrinkage
(c) They are prone to segregation

Which of these statements are ***correct*** :

(1) (a), (b) and (c) (2) (b) and (c) (3) (a) and (c) (4) (a) and (b)

99. Slump and compaction factors are two different measures of workability of concrete. For a slump of 0 to 20mm, what is the equivalent range of compaction factor ?

(1) 0.70-0.80 (2) 0.80 - 0.85 (3) 0.85 - 0.90 (4) 0.90-0.95

100. The fineness modulus of fine aggregate is 2.78 and of coarse aggregate is 7.82 and the desired fineness modulus of mixed aggregate is 6.14. What is the amount of fine aggregate to be mixed with one part of coarse aggregate ?

(1) 55% (2) 50% (3) 45% (4) 40%

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C

M.Phil./Ph.D./URS-EE-2019

SET-Y

SUBJECT : Civil Engineering

Sr. No. 10039

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate) (Signature of the Invigilator)

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1. For the combined sewerage system, egg shaped sewers are preferred because :
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   (3) NO_x, S02, SPM and CO (4) NO_x, SO_2, and CO

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   (3) Ion exchange method (4) Using excess alum dosage

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   (1) aeration (2) aeration and flocculation
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(3) saturated, wet, dry, submerged (4) dry, wet, submerged, saturated

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(3) roughness of particle (4) particle size distribution

18. The limit of the values of the coefficient of discharge of venturimeter is between :
(1) 0.60-0.75 (2) 0.76-0.80 (3) 0.81-0.94 (4) 0.95-0.99

19. Consider the following fluids :
(a) Blood (b) Glycerine
(c) Molasses (d) Slurry of clay in water
(e) Kerosene
Among the above, non-Newtonian fluids will include :
(1) b, d and e (2) b, d and c (3) a, c and d (4) a, d and e

20. Which one of the following statement is NOT correct ?
(1) Specific energy is the total energy above the floor of an open channel
(2) For a given specific energy, two depths exist and these are called alternate depth
(3) Critical velocity occurs at Froude number = 1
(4) Velocity of flow is critical at maximum specific energy

21. The permissible stresses in rivets under wind load conditions as per IS:800 can be exceeded by about :
(1) 50% (2) 33% (3) 25% (4) 10%

22. The type of stresses induced in the foundation bolts fixing a column to its footing is :
(1) pure tension (2) pure compression
(3) bearing (4) bending

23. Steel structures are ideally suitable for impact loads because they have high :
(1) plastic modulus (2) elastic modulus
(3) design stress (4) toughness value

24. When the load line coincides with the centroid of the rivet group, the rivets are subjected to :
(1) Tension only (2) Shear only
(3) Bending only (4) Shear as well as tension

25. Steel of yield strength 400MPa has been used in a structure. What is the value of the maximum allowable tensile strength :
(1) 96MPa (2) 120MPa (3) 240MPa (4) 400MPa

26. The slenderness ratio of lacing bars should not exceed :
(1) 145 (2) 120 (3) 100 (4) 75

27. How are the most commonly produced and used structural elements in frames, floors, beams, etc with high moment of inertia about x-axis designated ?
(1) ISWB-section (2) ISLB-section (3) ISMB-section (4) ISHB-section

28. Consider the following statements in respect of design of web and flange splices :
(a) Flange splice shall be designed for actual bending moment at the section
(b) Flange splice shall be designed for actual shear at the section
(c) Web splice shall be designed for actual bending moment at the section
(d) Web splice shall be designed for actual shear at the section
Choose the ***correct*** statement :
(1) a and c (2) b and c (3) a and b (4) a and d

29. If the shape factor of a section is 1.5 and the factor of safety to be adopted is 2, the load factor will be :
(1) 2 (2) 3 (3) 4 (4) 1.5

30. In a plastic analysis of structures, the segment between any two successive plastic hinges is assumed to deform as :
(1) A plastic material (2) As elastic material
(3) As rigid material (4) As inelastic material

31. A beam of length 10m carries a udl of 20kN/m over its entire length and rests on two simple supports. In order that the maximum bending moment produced in the beam is the least possible, the supports must be placed from the ends at a distance of :
(1) 1.75m (2) 2.07m (3) 4.14m (4) 5.86m

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(1) Force method (2) Displacement method
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40. A propped cantilever beam AB of span L is subjected to a moment M at the prop end B. The moment at the fixed end A is :
(1) 2M (2) M (3) 3M/4 (4) M/2

41. The transition curve used in the horizontal alignment of highways as per IRC recommendations is :
(1) Spiral (2) lemniscate
(3) Cubical parabola (4) any of the above

42. Bitumen of grade 80/100 means :
(1) its penetration value is 8mm (2) its penetration value is 10mm
(3) its penetration value is 8 to 10mm (4) its penetration value is 8 to 10cm

43. The alligator cracking in bituminous pavement is mainly due to :
(1) inadequate wearing course
(2) inadequate thickness of sub base course of pavement
(3) use of excessive bituminous material
(4) fatigue arising from repeated stress applications

44. In the Los Angeles Abrasion Test on aggregate, if the speed of the drum is increased to 50rpm, the abrasion value will :
(1) Remain unchanged (2) be unpredictable
(3) increase (4) decrease

45. When two roads with two lane, two way traffic cross at an uncontrolled intersection, the total number of major potential major conflict points would be :
(1) 32 (2) 24 (3) 16 (4) 4

46. If a descending gradient of 1 in 25 meets an ascending gradient of 1 in 40, the length of valley curve required for head light distance of 100m will be :
(1) 110m (2) 130m (3) 210m (4) 230m

47. For carrying out bituminous patch work during the rainy season, the most suitable binder is :
(1) Road tar (2) Hot bitumen
(3) Cutback bitumen (4) Bituminous emulsion

48. A vehicle was stopped in two seconds by fully jamming the brakes. The skid marks measured 9.8m. The average skid resistance coefficient will be :
(1) 0.25 (2) 0.4 (3) 0.5 (4) 0.7

49. The general requirement in constructing a reinforced concrete road is to place a single layer of reinforcement :
(1) Near the top of slab
(2) Near the bottom of slab
(3) At the middle of slab
(4) Equally distributed at the top and bottom

50. A 30m chain is found to be 0 lm too short throughout the measurement. If the distance measured is recorded as 600m, the actual distance will be :
(1) 598m (2) 599m (3) 601m (4) 602m

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(1) Dummy activity
(2) A real activity
(3) An event
(4) Both event and real activity

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(d) Mass concrete in bridge piers	(iv) Screed Vibrator
	(v) Manual compaction

Select the ***correct*** answer :

	(a)	(b)	(c)	(d)
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(2)	iii	iv	ii	i
(3)	ii	iii	iv	v
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Cement mortars richer than 1:3 are not used in masonry work because :
(a) There is no gain in strength of masonry
(b) There is high shrinkage
(c) They are prone to segregation

Which of these statements are ***correct*** :
(1) (a), (b) and (c) (2) (b) and (c) (3) (a) and (c) (4) (a) and (b)

59. Slump and compaction factors are two different measures of workability of concrete. For a slump of 0 to 20mm, what is the equivalent range of compaction factor ?
(1) 0.70-0.80 (2) 0.80 - 0.85 (3) 0.85 - 0.90 (4) 0.90-0.95

60. The fineness modulus of fine aggregate is 2.78 and of coarse aggregate is 7.82 and the desired fineness modulus of mixed aggregate is 6.14. What is the amount of fine aggregate to be mixed with one part of coarse aggregate ?
(1) 55% (2) 50% (3) 45% (4) 40%

61. It is required to produce a small scale map of an area in a magnetic zone by directl plotting and checking the work in the field itself. Which one of the following surve will be the most appropriate :
(1) Chain (2) Theodolite (3) Plane table (4) Compass

62. If in a triangle ABC b = 300m and angle ABC = 60°, then the radius of the circul curve passing through the points A, B and C will be :
(1) 86.60m (2) 100m (3) 126.60m (4) 173.20m

63. Which one of the following closely represents the shape of the earth ?
(1) Spheroid (2) Oblate spheroid
(3) Prolate spheroid (4) Ellipsoid

64. When the latitude is 56°15' N and declination is 17°30'S, the 'zenith distance' at the upper culmination of the star will be :
(1) 35°00'
(2) 73°30'
(3) 73°45'
(4) not determinable from the data given

65. If the cross sectional area of an embankment at 30m intervals are 20,40,60,50 and $30m^2$, respectively, the volume of embankment on the basis of prismoidal rule, is :
(1) $5300m^3$ (2) $8300m^3$ (3) $9300m^3$ (4) $9800m^3$

66. The main plate of a transit is divided into 1080 equal divisions, 60 divisions of the vernier coincides exactly with 59 divisions of the main plate. The least count (in seconds) of the transit is :
(1) 5 (2) 10 (3) 15 (4) 20

67. A 3000m long line lying at an elevation of 450m measures 10cm on a vertical photograph. The focal length of the camera is 21 cm. The scale of the photograph for the area having an elevation of 1000m will be :
(1) 1:20606 (2) 1:25008 (3) 1:27381 (4) 1:30421

68. The minimum dissolved oxygen which should always be present in water in order to save the aquatic life is :
(1) 1ppm (2) 4ppm (3) 10ppm (4) 40ppm

69. Septic tank is a :
(a) settling tank (b) digestion tank (c) aeration tank
(1) only (a) (2) (a) and (b) (3) (a) and (c) (4) (b) and (c)

70. The maximum efficiency of BOD removal is achieved in :
(1) aerated lagoons
(2) oxidation pond
(3) oxidation ditch
(4) trickling filter

71. Modular bricks are of nominal size 20 × 10 × 10 cm and 20% of the volume is lost in mortar between joints. What is the number of modular bricks required per cubic metre of brickwork ?
(1) 520 (2) 500 (3) 485 (4) 470

72. As per Indian Standards, the minimum compressive strength of a first class brick should be
(1) $75kg/cm^2$ (2) $90kg/cm^2$ (3) $100kg/cm^2$ (4) $125kg/cm^2$

73. The nail diameter should not be more than (t=least thickness of the wooden member to be connected) :
(1) t/6 (2) t/8 (3) t/10 (4) t/12

74. The moisture content in a structural timber should be :
(1) 15-25% (2) 10-20% (3) 5-10% (4) less than 5%

75. The carbon content of structural steel is :
(1) 0.75-1.00% (2) 0.50-0.75% (3) 0.25-0.50% (4) 0.10-0.25%

76. Which one of the following types of steel is used in the manufacture of rails ?
(1) Mild steel (2) Cast steel
(3) Manganese steel (4) Bessemer steel

77. For sand of uniform spherical particles, the ratio of void ratios in the loosest and the densest states is :
(1) 3.0 (2) 2.6 (3) 2.0 (4) 1.5

78. The correct order of increasing surface area of the soil is :
(1) sand, silt, clay and colloids (2) sand, silt, colloids and clay
(3) silt, sand, clay, and colloids (4) clay, silt, sand and colloids

79. Which one of the following statements provides the best argument that direct shear tests are not suited for determining shear parameters of a clayey soil ?
(1) Failure plane is not the weakest plane
(2) Satisfactory strain levels cannot be maintained
(3) Pore pressures developed cannot be measured
(4) Adequate consolidation cannot be ensured

80. The upstream slope of an earth dam under steady seepage condition is :
(1) phreatic line (2) flow line
(3) seepage line (4) equipotential line

81. The final deflection due to all loads including the effects of temperature, creep, and shrinkage and measured from the cast level of supports of floors, roofs, and all other horizontal members should NOT exceed :
(1) Span/250 (2) Span/300 (3) Span/350 (4) Span/400

82. In the limit state method of design, the failure criterion for reinforced concrete beams and columns is :
(1) Maximum shear stress theory (2) Maximum strain energy theory
(3) Distortion energy theory (4) Maximum principal strain theory

83. What should be the minimum grade of concrete in and around sea coast construction as per IS:456 ?
(1) M20 (2) M25 (3) M30 (4) M35

84. A reinforced concrete beam of span 4m has a cross section 150mm × 500mm. If checked for lateral stability and deflection, the beam will :
(1) Fail in both deflection and lateral stability
(2) Fail in lateral stability only
(3) Fail in deflection only
(4) Satisfies the requirements of lateral stability and deflection

85. If b = width, d = effective depth and D = overall depth, the maximum area of compressive reinforcement in a beam is :
(1) 0.04bd (2) 0.04bD (3) 0.12bd (4) 0.12bD

86. How does the bond stress acts on longitudinal reinforcement in a beam on the interface of bar and concrete ?
(1) compressive stress (2) tensile stress
(3) bearing stress (4) shear stress

87. Lap length of reinforcement in compression shall not be less than :
(1) 15Φ (2) 20Φ (3) 24Φ (4) 30Φ

88. The load carrying capacity of a column designed by working stress method is 1000kN. The collapse load of the column is :
(1) 662.5kN (2) 1000kN (3) 1250kN (4) 1500kN

89. Minimum clear covers to the main steel bars (in mm), in slab, beam, column and footing, respectively are :
(1) 15, 25, 40 and 75mm (2) 10, 15, 20 and 25mm
(3) 20, 25, 30 and 50mm (4) 20, 25, 35 and 70mm

90. For prestressed structural elements, high strength concrete is used primarily because :
(1) Modulus of elasticity and creep values are higher
(2) Higher modulus of elasticity and low creep
(3) Shrinkage is less but creep values are higher
(4) Both creep and shrinkage are more

91. A racing car with partially filled fuel tank moves in the horizontal direction at a uniform acceleration equal to 'g'. The free surface of the liquid fuel in the tank will assume a slope of :
(1) 45° (2) 30° (3) 25° (4) 15°

92. Which one of the following statement is NOT correct ?
(1) For water hammer to develop, the valve at the end of a pipeline must be fully closed
(2) Fall of pressure due to decrease in velocity results in the phenomenon of water hammer
(3) Water hammer occurs in a situation when there is unsteady flow in a pipe
(4) Propagation of high pressure through elastic media gives rise to water hammer

93. A 4 hour rainfall in a catchment of 250km^2 produces rainfall depth of 6.2cm and 5.0cm in successive 2 hour unit periods. Assuming the Φ index of soil to be 1.2 cm/hr, the run off volume in ha-m will be :
(1) 22 (2) 2200 (3) 16 (4) 1600

94. A channel designed by Lacey's theory has a mean velocity of one m/s. The silt factor is unity. The hydraulic mean radius will be :
(1) 2.5m (2) 2m (3) 1m (4) 0.5m

95. A pumped storage plant is a :
(1) High head plant (2) Run-off river plant
(3) Peak load plant (4) Base load plant

96. Probability of a 10 year flood to occur at least once in the next 4 years is :
(1) 25% (2) 35% (3) 50% (4) 60%

97. A motor shaft rotating with a speed of 90rpm decelerates uniformly when the motor is switched off and stops in 40sec. The number of revolutions made by the shaft in this would be :
(1) 10 (2) 20 (3) 30 (4) 40

98. In a particular material, if the modulus of rigidity is equal to the bulk modulus, the Poisson's coefficient will be :
(1) 1 (2) 0.50 (3) 0.25 (4) 0.125

99. Strain energy in a member is :
(1) Directly proportional to strains
(2) Directly proportional to changes in strains
(3) A function of strains as well as stresses
(4) A function of loads only

100. The 'Euler's load' for a column is 1000kN and crushing load is 1500kN. The Rankine's load is equal to :
(1) 600kN (2) 1000kN (3) 1500kN (4) 2500kN

Total No. of Printed Pages : 13

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SET-Y

D

M.Phil./Ph.D./URS-EE-2019

SUBJECT : Civil Engineering

Sr. No. 10040 .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate) (Signature of the Invigilator)

SEAL

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

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(1) they offer good flow velocity during the dry weather flow condition
(2) they are structurally more stable
(3) their maintenance is easier
(4) they are economical

32. Various units in a sewerage treatment are :
(a) screening
(b) grit removal
(c) secondary sedimentation
(d) aeration
(e) primary sedimentation
Their ***correct*** order of placement will be :
(1) b, a, d, e and c (2) b, a, d, c and e (3) a, b, c, d and e (4) a, b, e, c and d

33. One litre of sewage, when allowed to settle for 30 minutes gives a sludge volume 27cm^3. If the dry weight of this sludge is 3.0 grams, the sludge volume index will be :
(1) 100 (2) 81 (3) 24 (4) 9

34. Electrical conductivity of water and total dissolved solids (TDS) are interrelated. The value of electrical conductivity will :
(1) increase initially and then decrease with increase in TDS
(2) decrease initially and then increase with the increase in TDS
(3) increase with the increase in TDS
(4) decrease with the increase in TDS

35. Coal based thermal power stations pollute the atmosphere by adding :
(1) NO_x and SO_2 (2) NO_x, SO_2 and SPM
(3) NO_x, S02, SPM and CO (4) NO_x, SO_2, and CO

36. Zero hardness of water is achieved by :
(1) Using lime soda process
(2) Excess lime treatment
(3) Ion exchange method
(4) Using excess alum dosage

37. In a water treatment plant, dissolved iron and manganese can be removed from water by 6K :
(1) aeration (2) aeration and flocculation
(3) aeration and coagulation (4) aeration and sedimentation

38. What is the correct sequence of formation of the following compounds during chlorination of water in which ammonia is present ?
(a) NCl_3 (b) NH_2Cl (c) $NHCl_2$
Correct order is :
(1) a, b and c (2) b, a and c (3) c, a and b (4) c, b and a

39. Consider the following activities of a housing project :

(a) Flooring
(b) Wall plastering
(c) Conceal wiring
(d) Fixing door window frames
(e) Fixing door window shutters

The ***correct*** logical sequence of above activities will be

(1) a, b, c, d and e
(2) e, d, c, b and a
(3) d, c, b, e and a
(4) b, c, d, e and a

40. There are four consecutive activities in a simple linear network, each with mean duration of T and each with 'k' as the standard deviation of its duration. The overall project duration through these activities is likely to be in the range :

(1) $4T \pm 6K$ (2) $4T \pm 4K$ (3) $4T \pm 2k$ (4) $4T \pm k$

41. A racing car with partially filled fuel tank moves in the horizontal direction at a uniform acceleration equal to 'g'. The free surface of the liquid fuel in the tank will assume a slope of :

(1) 45° (2) 30° (3) 25° (4) 15°

42. Which one of the following statement is NOT correct ?

(1) For water hammer to develop, the valve at the end of a pipeline must be fully closed
(2) Fall of pressure due to decrease in velocity results in the phenomenon of water hammer
(3) Water hammer occurs in a situation when there is unsteady flow in a pipe
(4) Propagation of high pressure through elastic media gives rise to water hammer

43. A 4 hour rainfall in a catchment of $250km^2$ produces rainfall depth of 6.2cm and 5.0cm in successive 2 hour unit periods. Assuming the Φ index of soil to be 1.2 cm/hr, the run off volume in ha-m will be :

(1) 22
(2) 2200
(3) 16
(4) 1600

44. A channel designed by Lacey's theory has a mean velocity of one m/s. The silt factor is unity. The hydraulic mean radius will be :

(1) 2.5m
(2) 2m
(3) 1m
(4) 0.5m

45. A pumped storage plant is a :

(1) High head plant
(2) Run-off river plant
(3) Peak load plant
(4) Base load plant

46. Probability of a 10 year flood to occur at least once in the next 4 years is :
(1) 25% (2) 35% (3) 50% (4) 60%

47. A motor shaft rotating with a speed of 90rpm decelerates uniformly when the motor is switched off and stops in 40sec. The number of revolutions made by the shaft in this would be :
(1) 10 (2) 20 (3) 30 (4) 40

48. In a particular material, if the modulus of rigidity is equal to the bulk modulus, the Poisson's coefficient will be :
(1) 1 (2) 0.50 (3) 0.25 (4) 0.125

49. Strain energy in a member is :
(1) Directly proportional to strains
(2) Directly proportional to changes in strains
(3) A function of strains as well as stresses
(4) A function of loads only

50. The 'Euler's load' for a column is 1000kN and crushing load is 1500kN. The Rankine's load is equal to :
(1) 600kN (2) 1000kN (3) 1500kN (4) 2500kN

51. The permissible stresses in rivets under wind load conditions as per IS:800 can be exceeded by about :
(1) 50% (2) 33% (3) 25% (4) 10%

52. The type of stresses induced in the foundation bolts fixing a column to its footing is :
(1) pure tension (2) pure compression
(3) bearing (4) bending

53. Steel structures are ideally suitable for impact loads because they have high :
(1) plastic modulus (2) elastic modulus
(3) design stress (4) toughness value

54. When the load line coincides with the centroid of the rivet group, the rivets are subjected to :
(1) Tension only (2) Shear only
(3) Bending only (4) Shear as well as tension

55. Steel of yield strength 400MPa has been used in a structure. What is the value of the maximum allowable tensile strength :
(1) 96MPa (2) 120MPa (3) 240MPa (4) 400MPa

56. The slenderness ratio of lacing bars should not exceed :
(1) 145 (2) 120 (3) 100 (4) 75

57. How are the most commonly produced and used structural elements in frames, floors, beams, etc with high moment of inertia about x-axis designated ?
(1) ISWB-section (2) ISLB-section (3) ISMB-section (4) ISHB-section

58. Consider the following statements in respect of design of web and flange splices :
(a) Flange splice shall be designed for actual bending moment at the section
(b) Flange splice shall be designed for actual shear at the section
(c) Web splice shall be designed for actual bending moment at the section
(d) Web splice shall be designed for actual shear at the section
Choose the ***correct*** statement :
(1) a and c (2) b and c (3) a and b (4) a and d

59. If the shape factor of a section is 1.5 and the factor of safety to be adopted is 2, the load factor will be :
(1) 2 (2) 3 (3) 4 (4) 1.5

60. In a plastic analysis of structures, the segment between any two successive plastic hinges is assumed to deform as :
(1) A plastic material (2) As elastic material
(3) As rigid material (4) As inelastic material

61. Modular bricks are of nominal size 20 × 10 × 10 cm and 20% of the volume is lost in mortar between joints. What is the number of modular bricks required per cubic metre of brickwork ?
(1) 520 (2) 500 (3) 485 (4) 470

62. As per Indian Standards, the minimum compressive strength of a first class brick should be
(1) 75kg/cm^2 (2) 90kg/cm^2 (3) 100kg/cm^2 (4) 125kg/cm^2

63. The nail diameter should not be more than (t=least thickness of the wooden member to be connected) :
(1) t/6 (2) t/8 (3) t/10 (4) t/12

64. The moisture content in a structural timber should be :
(1) 15-25% (2) 10-20% (3) 5-10% (4) less than 5%

65. The carbon content of structural steel is :
(1) 0.75-1.00% (2) 0.50-0.75% (3) 0.25-0.50% (4) 0.10-0.25%

66. Which one of the following types of steel is used in the manufacture of rails ?
(1) Mild steel (2) Cast steel
(3) Manganese steel (4) Bessemer steel

67. For sand of uniform spherical particles, the ratio of void ratios in the loosest and the densest states is :
(1) 3.0 (2) 2.6 (3) 2.0 (4) 1.5

68. The correct order of increasing surface area of the soil is :
(1) sand, silt, clay and colloids (2) sand, silt, colloids and clay
(3) silt, sand, clay, and colloids (4) clay, silt, sand and colloids

69. Which one of the following statements provides the best argument that direct shear tests are not suited for determining shear parameters of a clayey soil ?
(1) Failure plane is not the weakest plane
(2) Satisfactory strain levels cannot be maintained
(3) Pore pressures developed cannot be measured
(4) Adequate consolidation cannot be ensured

70. The upstream slope of an earth dam under steady seepage condition is :
(1) phreatic line (2) flow line
(3) seepage line (4) equipotential line

71. Undisturbed soil samples are required to conduct :
(1) Hydrometer test (2) consolidation test
(3) Shrinkage limit test (4) specific gravity test

72. When the degree of consolidation is 50%, the time factor is about :
(1) 0.2 (2) 0.5 (3) 1.0 (4) 2.0

73. Which one of the following, gives the correct decreasing order of the densities of a soil sample ?
(1) saturated, submerged, wet, dry (2) saturated, wet, submerged, dry
(3) saturated, wet, dry, submerged (4) dry, wet, submerged, saturated

74. Consider the following types of soil tests :
(a) California bearing ratio
(b) Consolidation
(c) Unconfined Compression
The soil tests required to be done in the case undisturbed samples include :
(1) a, b and C (2) a and b (3) a and c (4) b and c

75. The direction of seepage during seepage through an earth mass is :

(1) Along the direction of gravity

(2) Parallel to equipotential lines

(3) Perpendicular to the equipotential lines

(4) Perpendicular to stream lines

76. The difference between maximum void ratio and minimum void ratio of a sand sample is 0.30. If the relative density of this sample is 66.60% at a void ratio of 0.40, the void ratio of this sample at its loosest state will be :

(1) 0.40 (2) 0.60 (3) 0.70 (4) 0.75

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

(1) density index (2) particle size

(3) roughness of particle (4) particle size distribution

78. The limit of the values of the coefficient of discharge of venturimeter is between :

(1) 0.60-0.75 (2) 0.76-0.80 (3) 0.81-0.94 (4) 0.95-0.99

79. Consider the following fluids :

(a) Blood (b) Glycerine

(c) Molasses (d) Slurry of clay in water

(e) Kerosene

Among the above, non-Newtonian fluids will include :

(1) b, d and e (2) b, d and c (3) a, c and d (4) a, d and e

80. Which one of the following statement is NOT correct ?

(1) Specific energy is the total energy above the floor of an open channel

(2) For a given specific energy, two depths exist and these are called alternate depth

(3) Critical velocity occurs at Froude number = 1

(4) Velocity of flow is critical at maximum specific energy

81. The transition curve used in the horizontal alignment of highways as per IRC recommendations is :

(1) Spiral (2) lemniscate

(3) Cubical parabola (4) any of the above

82. Bitumen of grade 80/100 means :

(1) its penetration value is 8mm (2) its penetration value is 10mm

(3) its penetration value is 8 to 10mm (4) its penetration value is 8 to 10cm

83. The alligator cracking in bituminous pavement is mainly due to :
(1) inadequate wearing course
(2) inadequate thickness of sub base course of pavement
(3) use of excessive bituminous material
(4) fatigue arising from repeated stress applications

84. In the Los Angeles Abrasion Test on aggregate, if the speed of the drum is increased to 50rpm, the abrasion value will :
(1) Remain unchanged (2) be unpredictable
(3) increase (4) decrease

85. When two roads with two lane, two way traffic cross at an uncontrolled intersection, the total number of major potential major conflict points would be :
(1) 32 (2) 24 (3) 16 (4) 4

86. If a descending gradient of 1 in 25 meets an ascending gradient of 1 in 40, the length of valley curve required for head light distance of 100m will be :
(1) 110m (2) 130m (3) 210m (4) 230m

87. For carrying out bituminous patch work during the rainy season, the most suitable binder is :
(1) Road tar (2) Hot bitumen
(3) Cutback bitumen (4) Bituminous emulsion

88. A vehicle was stopped in two seconds by fully jamming the brakes. The skid marks measured 9.8m. The average skid resistance coefficient will be :
(1) 0.25 (2) 0.4 (3) 0.5 (4) 0.7

89. The general requirement in constructing a reinforced concrete road is to place a single layer of reinforcement :
(1) Near the top of slab (2) Near the bottom of slab
(3) At the middle of slab (4) Equally distributed at the top and bottom

90. A 30m chain is found to be 0 lm too short throughout the measurement. If the distance measured is recorded as 600m, the actual distance will be :
(1) 598m (2) 599m (3) 601m (4) 602m

91. It is required to produce a small scale map of an area in a magnetic zone by directly plotting and checking the work in the field itself. Which one of the following survey will be the most appropriate :
(1) Chain (2) Theodolite (3) Plane table (4) Compass

92. If in a triangle ABC b = 300m and angle ABC = 60°, then the radius of the circular curve passing through the points A, B and C will be :

(1) 86.60m (2) 100m (3) 126.60m (4) 173.20m

93. Which one of the following closely represents the shape of the earth ?

(1) Spheroid (2) Oblate spheroid

(3) Prolate spheroid (4) Ellipsoid

94. When the latitude is 56°15' N and declination is 17°30'S, the 'zenith distance' at the upper culmination of the star will be :

(1) 35°00' (2) 73°30'

(3) 73°45' (4) not determinable from the data given

95. If the cross sectional area of an embankment at 30m intervals are 20,40,60,50 and $30m^2$, respectively, the volume of embankment on the basis of prismoidal rule, is :

(1) $5300m^3$ (2) $8300m^3$ (3) $9300m^3$ (4) $9800m^3$

96. The main plate of a transit is divided into 1080 equal divisions, 60 divisions of the vernier coincides exactly with 59 divisions of the main plate. The least count (in seconds) of the transit is :

(1) 5 (2) 10 (3) 15 (4) 20

97. A 3000m long line lying at an elevation of 450m measures 10cm on a vertical photograph. The focal length of the camera is 21 cm. The scale of the photograph for the area having an elevation of 1000m will be :

(1) 1:20606 (2) 1:25008 (3) 1:27381 (4) 1:30421

98. The minimum dissolved oxygen which should always be present in water in order to save the aquatic life is :

(1) 1ppm (2) 4ppm (3) 10ppm (4) 40ppm

99. Septic tank is a :

(a) settling tank (b) digestion tank (c) aeration tank

(1) only (a) (2) (a) and (b) (3) (a) and (c) (4) (b) and (c)

100. The maximum efficiency of BOD removal is achieved in :

(1) aerated lagoons (2) oxidation pond

(3) oxidation ditch (4) trickling filter

Revised Key

PH.D/URS (CIVIL) PAGE: 1

SET : A

1. 1	16. 4	31. 3	46. 3	61. 1	76. 4	91. 1
2. 3	17. 3	32. 4	47. 2	62. 2	77. 3	92. 4
3. 4	18. 2	33. 1	48. 1	63. 4	78. 1	93. 3
4. 3	19. 3	34. 2	49. 3	64. 1	79. 2	94. 1
5. 1	20. 1	35. 2	50. 4	65. 3	80. 4	95. 2
6. 2	21. 4	36. 4	51. 2	66. 2	81. 2	96. 4
7. 4	22. 1	37. 3	52. 1	67. 3	82. 1	97. 3
8. 3	23. 2	38. 4	53. 3	68. 4	83. 4	98. 4
9. 1	24. 3	39. 1	54. 4	69. 3	84. 2	99. 1
10. 1	25. 1	40. 2	55. 3	70. 1	85. 3	100. 2
11. 3	26. 4	41. 4	56. 2	71. 2	86. 1	
12. 4	27. 2	42. 3	57. 1	72. 4	87. 3	
13. 2	28. 3	43. 1	58. 4	73. 1	88. 4	
14. 3	29. 3	44. 2	59. 3	74. 3	89. 2	
15. 1	30. 1	45. 4	60. 4	75. 2	90. 3	

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Revised key

SET : B

1. 4	16. 4	31. 1	46. 2	61. 4	76. 4	91. 3
2. 3	17. 3	32. 3	47. 1	62. 1	77. 3	92. 4
3. 1	18. 1	33. 4	48. 4	63. 2	78. 2	93. 1
4. 2	19. 2	34. 3	49. 3	64. 3	79. 3	94. 2
5. 4	20. 4	35. 1	50. 4	65. 1	80. 1	95. 2
6. 3	21. 1	36. 2	51. 1	66. 4	81. 2	96. 4
7. 2	22. 4	37. 4	52. 2	67. 2	82. 1	97. 3
8. 1	23. 3	38. 3	53. 4	68. 3	83. 4	98. 4
9. 3	24. 1	39. 1	54. 1	69. 3	84. 2	99. 1
10. 4	25. 2	40. 1	55. 3	70. 1	85. 3	100. 2
11. 2	26. 4	41. 2	56. 2	71. 3	86. 1	
12. 4	27. 3	42. 1	57. 3	72. 4	87. 3	
13. 1	28. 4	43. 3	58. 4	73. 2	88. 4	
14. 3	29. 1	44. 4	59. 3	74. 3	89. 2	
15. 2	30. 2	45. 3	60. 1	75. 1	90. 3	

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Revised Key

PH.D/URS (CIVIL) PAGE: 3

SET : C

1. 4	16. 2	31. 2	46. 2	61. 3	76. 3	91. 1
2. 1	17. 1	32. 4	47. 4	62. 4	77. 2	92. 2
3. 2	18. 4	33. 1	48. 3	63. 2	78. 1	93. 4
4. 3	19. 3	34. 3	49. 1	64. 3	79. 3	94. 1
5. 1	20. 4	35. 2	50. 1	65. 1	80. 4	95. 3
6. 4	21. 2	36. 4	51. 3	66. 4	81. 1	96. 2
7. 2	22. 1	37. 3	52. 4	67. 3	82. 4	97. 3
8. 3	23. 4	38. 1	53. 1	68. 2	83. 3	98. 4
9. 3	24. 2	39. 2	54. 2	69. 3	84. 1	99. 3
10. 1	25. 3	40. 4	55. 2	70. 1	85. 2	100. 1
11. 2	26. 1	41. 1	56. 4	71. 4	86. 4	
12. 1	27. 3	42. 3	57. 3	72. 3	87. 3	
13. 3	28. 4	43. 4	58. 4	73. 1	88. 4	
14. 4	29. 2	44. 3	59. 1	74. 2	89. 1	
15. 3	30. 3	45. 1	60. 2	75. 4	90. 2	

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Revised key

PH.D/URS (CIVIL) PAGE: 4

SET : D

1. 1	16. 4	31. 4	46. 2	61. 4	76. 2	91. 3
2. 4	17. 3	32. 1	47. 3	62. 3	77. 1	92. 4
3. 3	18. 4	33. 2	48. 4	63. 1	78. 4	93. 2
4. 1	19. 1	34. 3	49. 3	64. 2	79. 3	94. 3
5. 2	20. 2	35. 1	50. 1	65. 4	80. 4	95. 1
6. 4	21. 2	36. 4	51. 2	66. 3	81. 1	96. 4
7. 3	22. 4	37. 2	52. 1	67. 2	82. 3	97. 3
8. 4	23. 1	38. 3	53. 4	68. 1	83. 4	98. 2
9. 1	24. 3	39. 3	54. 2	69. 3	84. 3	99. 3
10. 2	25. 2	40. 1	55. 3	70. 4	85. 1	100. 1
11. 3	26. 4	41. 1	56. 1	71. 2	86. 2	
12. 4	27. 3	42. 2	57. 3	72. 1	87. 4	
13. 1	28. 1	43. 4	58. 4	73. 3	88. 3	
14. 2	29. 2	44. 1	59. 2	74. 4	89. 1	
15. 2	30. 4	45. 3	60. 3	75. 3	90. 1	

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