

**CIVIL ENGINEERING**

**CODE :- 05**

**A**

Time Allowed: Two Hours

Marks: 100

Name: _____	Roll No. _____
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*Read instructions given below before opening this booklet:*

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO**

1. Use only **BLUE Ball Point** Pen.
2. In case of any defect - Misprint, Missing Question/s Get the booklet changed. No complaint shall be entertained after the examination.
3. Before you mark the answer, read the instruction on the OMR Sheet (Answer Sheet) also before attempting the questions and fill the particulars in the ANSWER SHEET carefully and correctly.
4. There are FOUR options to each question. Darken only one to which you think is the right answer. There will be no Negative Marking.
5. Answer Sheets will be collected after the completion of examination and no candidate shall be allowed to leave the examination hall earlier.
6. The candidates are to ensure that the Answer Sheet is handed over to the room invigilator only.
7. Rough work, if any, can be done on space provided at the end of the Question Booklet itself. No extra sheet will be provided in any circumstances.
8. Write the BOOKLET SERIES in the space provided in the answer sheet, by darkening the corresponding circles.
9. Regarding incorrect questions or answers etc. Candidates kindly see NOTE at the last page of the Booklet.

**SEAL**

1. A cantilever beam of tubular section consists of 2 materials, copper as outer cylinder and steel as inner cylinder. It is subjected to a temperature rise of  $20^{\circ}\text{C}$  and  $\alpha_{\text{copper}} > \alpha_{\text{steel}}$ . The stresses developed in the tubes will be
  - (A) Compression in steel and tension in copper
  - (B) Tension in steel and compression in copper
  - (C) No stress in both
  - (D) Tension in both the materials
  
2. For ductile materials, the most appropriate failure theory is
  - (A) Maximum shear stress theory
  - (B) Maximum principal stress theory
  - (C) Maximum principal strain theory
  - (D) Shear strain energy theory
  
3. Consider for following statements: The principle of superposition is applied to
  1. Linear elastic bodies
  2. Bodies subjected to small deformations
 Of these statements
  - (A) 1 alone is correct
  - (B) 1 and 2 are correct
  - (C) 2 alone is correct
  - (D) Neither 1 nor 2 is correct
  
4. An elastic bar of length 'l', cross sectional area A, young's modulus of elasticity E and self-weight W is hanging vertically. It is subjected to a load P applied axially at the bottom end. The total elongation of the bar is given by
  - (A)  $\frac{Wl}{AE} + \frac{Pl}{AE}$
  - (B)  $\frac{Wl}{2AE} + \frac{Pl}{AE}$
  - (C)  $\frac{Wl}{2AE} + \frac{Pl}{2AE}$
  - (D)  $\frac{Wl}{AE} + \frac{Pl}{2AE}$
  
5. The limit of proportionality is applicable more in the case of
  - (A) Concrete
  - (B) Wood
  - (C) Cast iron
  - (D) Mild steel
  
6. According to Tresca, yield locus is a/an.
  - (A) Rectangle
  - (B) Circle
  - (C) Hexagon
  - (D) Ellipse
  
7. A horizontal beam is hinged at 'R' and supported on rollers at the end 'S'. It carries inclined loads. To determine the support reactions, the funicular polygon.
  - (A) Must start only from the support 'S'
  - (B) Must start only from the support 'R'.
  - (C) Could start from anywhere on the vertical line through 'S'.
  - (D) Could start from anywhere between 'R' and 'S'.
  
8. For a given system of coplanar forces if the pole 'O' of the force polygon moves along a straight line OP, then the sides of the funicular polygon would rotate about fixed points all of which lie on
  - (A) A straight line parallel to OP
  - (B) A circle with centre at O
  - (C) An ellipse with OP as the major axis
  - (D) A circle with centre at P

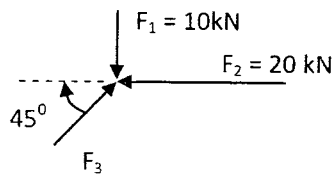
9. Consider the following statements:  
 I. The intersection of the first and last ray in funicular diagram is on the line of action of the resultant  
 II. Intersection of first and last ray in polar diagram gives the magnitude of the resultant.  
 Of these statements.  
 (A) Both I and II are true (B) I is false but II is true  
 (C) I is true but II is false (D) Both I and II are false

10. In a closed-coiled helical spring subjected to an axial load, other quantities remaining the same, if the wire diameter is doubled, then the stiffness of the spring when compared to the original one, will become  
 (A) Twice (B) Four times (C) Eight times (D) Sixteen times

11. The cross-section of a bar is subjected to a uniaxial tensile stress  $p$ . the tangential stress on a plane inclined at  $\theta$  to the cross-section of the bar would be  
 (A)  $\frac{p \sin 2\theta}{2}$  (B)  $p \sin 2\theta$  (C)  $\frac{p \cos 2\theta}{2}$  (D)  $p \cos 2\theta$

12. A column of height 'H' and area at top 'A' has the same strength throughout its length, under its own weight and applied stress ' $p_0$ ' at the top. Density of column material is ' $\rho$ '. To satisfy the above condition, the area of the column at the bottom should be  
 (A)  $Ae^{H\rho/p}$  (B)  $Ae^{\rho H/p}$  (C)  $Ae^{p H\rho}$  (D)  $Ae^{-\rho H/p}$

13. For the coplanar concurrent system of forces as shown in the given figure, the system will be



- (A) In equilibrium if  $|F_3| = 10 \text{ Kn}$   
 (B) In equilibrium if  $|F_3| = 10\sqrt{2}\text{kN}$   
 (C) In equilibrium if  $|F_3| = 20 \text{ kN}$   
 (D) Will not be in equilibrium whatever be the magnitude of  $F_3$
14. Polar moment of inertia of the cross-section of a member is determined to asses the strength of member in  
 (A) Bending (B) Torsion (C) Axial force (D) Shear
15. If the trace of a load is inside the kern of the section of a column, the stresses are  
 (A) Of the same sign at all points in the section  
 (B) Of different sign inside and outside the kern  
 (C) Of maximum value at the centroid of the section  
 (D) Uniform at all points in the section.

16. In a system of coplanar forces, when the force polygon closed but funicular polygon does not close, the forces are  
 (A) Equivalent to a couple  
 (B) Equivalent to a resultant whose magnitude, direction and line of action can be determined  
 (C) In equilibrium  
 (D) Equivalent to a couple and a resultant force
17. A simply supported beam of span  $(l + 2a)$  with equal overhangs  $(a)$  carries a uniformly distributed load over the whole length the B.M. changes sign if  
 (A)  $l > 2a$                       (B)  $l < 2a$                       (C)  $l = 2a$                       (D)  $l > 3a$
18. In order to find the resultant of coplanar parallel system of forces, the correct sequence of the graphical procedure to be followed is  
 (A) Force diagram, space diagram, funicular polygon and polar diagram  
 (B) Funicular polygon, force diagram, space diagram and polar diagram  
 (C) Space diagram, force diagram, polar diagram and funicular polygon  
 (D) Space diagram, funicular polygon, force diagram and polar diagram
19. The stress at which a material fractures under large number of reversals of stress is called  
 (A) Endurance limit                      (B) Creep  
 (C) Ultimate strength                      (D) Residual stress
20. The shear caused by sinking of one of the support by  $\Delta$  of simply supported beam of span  $L$  & flexural rigidity  $EI$  is  
 (A)  $\frac{12EI}{L^3} \Delta$                       (B)  $\frac{3EI}{L^3} \Delta$                       (C)  $\frac{6EI}{L^3} \Delta$                       (D) Zero
21. Poisson's ratio for cork is  
 (A) 0                      (B) 0.2                      (C) 0.25                      (D) None of the above
22. For graphical method of solution of plane truss, the maximum numbers of unknown forces at a joint should not be more than  
 (A) One                      (B) Two                      (C) Three                      (D) None of above
23. Consider the following assumptions in the analysis of a plane truss  
 I. The individual members are straight  
 II. The individual members are connected by frictionless hinges  
 III. The loads and reactions act only at the joint  
 Of these assumptions  
 (A) I and II are valid                      (B) I and III are valid  
 (C) II and III are valid                      (D) I, II and III are valid

24. Consider the following statements:  
 Sinking of an intermediate support of a continuous beam
- I. Reduces the negative moment at support
  - II. Increase the negative moment at support
  - III. Reduces the positive moment at the center of span
  - IV. Increase the positive moment at the centre of span
- Of these statement
- (A) I and IV are correct (B) I and III are correct  
 (C) II and III are correct (D) II and IV are correct
25. System A is a simply supported beam with a load  $P$  at mid span. System B is the same beam but the load is replaced by a udl of intensity  $P/L$  where  $L$  is the span. The mid span deflection of system B will
- (A) Be the same as that of system 'A' at mid span
  - (B) Be less than as that of system 'A' at mid span
  - (C) Be more than as that of system 'A' at mid span
  - (D) Bear no relation to that of system A
26. In a two hinged arch an increase in temperature induces
- (A) No bending moment in the arch rib
  - (B) Uniform bending moment in the arch rib
  - (C) Maximum bending moment at the crown
  - (D) Minimum bending moment at the crown
27. The shape of the bending moment diagram over the length of a beam, having no external load, is always
- (A) Linear (B) Parabolic (C) Cubical (D) Circular
28. Match List I with List II and select the correct answer using the codes given below the lists:
- | List I<br>(Type of soil)  | List II<br>(mode of transportation and position)  |
|---|---|
| A. Lacustrine soil<br>B. Alluvial soil<br>C. Aeolian soil<br>D. Marine soil | 1. Transportation by wind<br>2. Transportation by running water<br>3. Deposited at bottom of lakes<br>4. Deposited in sea water |
- Codes:
- (A) A B C D (B) A B C D (C) A B C D (D) A B C D  
 1 2 3 4 3 2 1 4 3 2 4 1 1 3 2 4
29. The correct increasing order of capillary rise at a given temperature in different types of soil is
- (A) Fine sand, silt, clay, colloids (B) Fine sand, clay silt, colloids
  - (C) Fine sand, clay, colloids, silt (D) Silt, fine sand, clay, colloids
30. Find sand comprises of
- (A) Montmorillonite (B) Halloysite (C) Kaolinite (D) Rock minerals
31. The type of soil structure in which particles of soil are arranged in face-to-face orientation is called
- (A) Honeycomb (B) Flocculent
  - (C) Cohesive matrix (D) Dispersed

32. For the purpose of designing a well point system for lowering ground water table in a sandy silt deposit, the coefficient of permeability of the soil is to be determined. Which one of the following methods would be most suitable?  
 (A) Constant head permeameter test (B) Variable head permeameter test  
 (C) Pumping out test in field (D) Pumping in test in field
33. Due to a rise of temperature, the viscosity and unit weight of the percolating fluid are reduced to 75% to 97% respectively. Other things being constant, calculate the percentage change in the coefficient of permeability.  
 (A) 26.5% (B) 29.5% (C) 31.5% (D) 33.5%
34. The ratio of specific yield to specific retention of an porosity 50% is 1.5, the specific yield from it is  
 (A) 20% (B) 30% (C) 37.5% (D) 25%
35. The mass specific gravity of a fully saturated specimen of clay having a water content of 36% is 1.86. On oven drying, the mass specific gravity drops to 1.72. Calculate the specific gravity of clay and its shrinkage limit.  
 (A)  $G=2.69$ ,  $w_s=21\%$  (B)  $G=2.69$ ,  $w_s=25\%$   
 (C)  $G=2.89$ ,  $w_s=21\%$  (D)  $G=2.79$ ,  $w_s=27\%$
36. A flownet is drawn to obtain  
 (A) Seepage, coefficient of permeability and uplift pressure  
 (B) Coefficient of permeability, uplift pressure and exit gradient  
 (C) Exit gradient, uplift pressure, seepage quantity  
 (D) Exit gradient, seepage and coefficient of permeability
37. In an anisotropic soil field if  $k_x$  is the permeability coefficient in x-direction and  $k_y$  is the permeability coefficient in y-direction, then the equivalent permeability of transformed field for determination of discharge is  
 (A)  $K_{eq} = \sqrt{k_x/k_y}$  (B)  $K_{eq} = \sqrt{\frac{k_x + k_y}{k_x - k_y}}$   
 (C)  $K_{eq} = \sqrt{k_x \cdot k_y}$  (D)  $K_{eq} = \sqrt{\frac{1 + k_x}{1 - k_y}}$
38. Consider the following characteristics of soil layer,  
 1. Poisson's Ratio 4. Effect of water table  
 2. Young's modulus 5. Rigidity of footing  
 3. Finite nature of soil
- Westergaard's analysis for pressure distribution in soil utilizes  
 (A) 1, 3, 4 and 5 (B) 2, 3, 4 and 5 (C) 3, 4 and 5 (D) 1 and 5
39. Consider the following statement related to triaxial test:  
 1. Failure occurs along predetermined plane  
 2. Intermediate and minor principal stresses are equal  
 3. Volume changes can be measured  
 4. Field condition can be simulated
- Of these statements  
 (A) 1, 2 & 3 are correct (B) 1, 2 & 4 are correct  
 (C) 1, 3 & 4 are correct (D) 2, 3 & 4 are correct

40. Which one of the following planes is most likely to be the failure plane in sandy soils?  
 (A) Plane carrying maximum shear stress  
 (B) Plane carrying maximum normal stress  
 (C) Plane carrying maximum angle of obliquity  
 (D) Principal plane
41. For stability analysis of an earth dam for steady seepage case, the most appropriate test would be the  
 (A) Unconsolidated undrained test (B) Consolidated undrained test  
 (C) Unconsolidated drained test (D) Consolidated drained test
42. Total settlement of a compressible soil stratum of 2 m deep and having coefficient of volume compressibility of  $0.02 \text{ cm}^2/\text{kg}$  under a pressure increment of  $2 \text{ kg/cm}^2$  will be  
 (A) 2 cm (B) 4cm (C) 8cm (D) 10cm
43. The total passive earth pressure per meter length against a retaining wall of height 3m. with backfill of unit weight  $1.8 \text{ t/m}^3$  and angle of internal friction  $30^\circ$  will be  
 (A) 21.2 t/m (B) 22.8 t/m (C) 24.3 t/m (D) 26.5 t/m
44. Consider the following statements,  
 Lime stabilization leads to  
 1. Decrease in shrinkage limit  
 2. Increase in plastic limit  
 3. Decrease in liquid limit  
 4. Flocculation of clay particles
- Of these statements  
 (A) 1, 2 & 3 are correct (B) 1, 2 & 4 are correct  
 (C) 1, 3 & 4 are correct (D) 2, 3 & 4 are correct
45. A soil has a discharge velocity of  $6 \times 10^{-7} \text{ m/s}$  and a void ratio of 0.5. its seepage velocity is  
 (A)  $18 \times 10^{-7} \text{ m/s}$  (B)  $12 \times 10^{-7} \text{ m/s}$   
 (C)  $6 \times 10^{-7} \text{ m/s}$  (D)  $3 \times 10^{-7} \text{ m/s}$
46. A surface footing 1 m. x 1 m. in sand settles by 5 cm. under a pressure intensity of q. If the size of this surface footing is increased to 3m. x 4m. , then under the same intensity of pressure, the settlement will be  
 (A) More than 5cm (B) Less than 5 cm  
 (C) Remain same (D) Indeterminate
47. Negative skin friction on a pile under vertical compressive load acts  
 (A) Downwards & increase the load carrying capacity of the pile  
 (B) Downwards & reduces the load carrying capacity of the pile  
 (C) Upwards and increase the load carrying capacity of the pile  
 (D) Downwards & maintains the same load carrying capacity of the pile.
48. Limiting gradient in mountainous area is recommended as  
 (A) 6% (B) 5% (C) 8% (D) 7 %
49. The 30<sup>th</sup> highest hour volume is  
 (A) The average of the 30 peak hour volumes in a month  
 (B) The hourly volume which is exceeded by only 30 hours in a year  
 (C) The hourly volume which is exceeded by only 29 hours in a year  
 (D) The average of the 30 highest volumes in a year

50. An enoscope is used for measuring  
 (A) Running speed (B) Time mean speed  
 (C) Spot speed (D) Overall speed
51. The cumulative speed distribution curve is usually adopted for geometric design of highway. The percentile speed adopted for geometric design is  
 (A) 85<sup>th</sup> percentile speed (B) 90<sup>th</sup> percentile speed  
 (C) 98<sup>th</sup> percentile speed (D) 99.9<sup>th</sup> percentile speed

52. Match list I with list II and select the correct answer using the codes given below the lists

**List I**

- A. Penetration test  
 B. Marshall Test  
 C. Ring and ball test  
 D. Bankelman Beam Test

**List II**

1. Design of bituminous concrete mix  
 2. Overlay design  
 3. Gradation of asphalt cement  
 4. Determination of softening point

Codes:

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

53. In the design of highways expansion and contraction joints should respectively be provided at  
 (A) 50m. and 32 m. (B) 50m. and 10 m.  
 (C) 25m. and 10 m. (D) 25m. and 32 m.
54. Reflection cracking is observed in  
 (A) Flexible pavement  
 (B) Rigid pavement  
 (C) Rigid overlay over flexible pavement  
 (D) Bituminous overlay over cement concrete pavement
55. Bankelman beam deflection method is used for design of  
 (A) Rigid overlay on rigid pavement (B) Flexible overlay on flexible pavement  
 (C) Flexible overlay on rigid pavement (D) Rigid overlay on flexible pavement
56. In the revised CBR design method recommended by the IRC for the design of flexible pavement, the total thickness depends upon  
 (A) CBR value of soil only  
 (B) CBR value of soil and magnitude of wheel load  
 (C) CBR value of soil and number of commercial vehicles per day  
 (D) CBR value of soil and cumulative standard axle loads.
57. Which of the following causes raveling in bituminous pavements  
 (A) Use of soft bitumen (B) Excessive bitumen content  
 (C) Low bitumen content (D) Use of open graded aggregates
58. Which of the following statements regarding ballast material are correct?  
 1. Brick ballast has poor drainage characteristics  
 2. Coal ash is not used as ballast with steel or cast iron sleepers  
 3. Gravel ballast gives better performance in soft formation  
 4. Sand ballast causes excessive wear on top of rail

Select the correct answer using the codes given below

**Codes:**

- (A) 1 and 2 (B) 1 and 4 (C) 1 and 3 (D) 2, 3 and 4



59. Which one of the following relates to the percussion theory for explaining the causes of creep?  
 (A) Pushing the rails forward and backward during starting and slowing  
 (B) Impact of wheels at the rail end ahead at joints  
 (C) Pushing the rail off the track due to the thrust on driving wheels  
 (D) Formation of vertical reverse curves behind and ahead of wheels
60. Wear of rail is maximum in  
 (A) Tangent track (B) Sharp curve  
 (C) Tunnels (D) Coastal area
61. The sleeper density of a BG track is  $(n + 6)$  in metric units. The number of sleepers per 1.024 km length of track is  
 (A) 1520 (B) 1630 (C) 1720 (D) 1800
62. The axle load including weight of wheels and axle (provided the rail has not lost more than 5% of its original section) for a 44.5 kg/m rail section for broad gauge shall be  
 (A) 17.5 tonnes (B) 19.0 tonnes  
 (C) 23.0 tonnes (D) 28.5 tonnes
63. A train is hauled by 2-8-2 locomotive with 22.5 tonnes load on each driving axle. Assuming the coefficient of rail wheel to be 0.25, what would be the hauling capacity of the locomotive?  
 (A) 15.0 tonnes (B) 22.5 tonnes  
 (C) 45.0 tonnes (D) 90.0 tonnes
64. Match list I and list II and select correct answer using codes given below the list:
- | <b>List I</b>   | <b>List II</b>         |
|---|------------------------|
| A. Distance between adjoining face of running rail and check rail                                       | 1. Heel Divergence     |
| B. Distance through which the tongue rail moves laterally at the Toe of switch for the movement of rail | 2. Flangeway clearance |
| C. Distance between the gauge faces of the stock rail and tongue Rail at the heel                       | 3. Throw of switch     |
| D. Angle between the gauge face of stock rail and tongue rail   | 4. Switch angle        |
- Codes:**
- |             |             |             |             |
|-------------|-------------|-------------|-------------|
| (A) A B C D | (B) A B C D | (C) A B C D | (D) A B C D |
| 1 2 3 4     | 1 3 2 4     | 3 1 2 4     | 2 1 3 4     |
65.  $S_2$  profile can occur at  
 (A) A break in slope from mild to steep  
 (B) A break in slope from steep to mild  
 (C) The d/s of a sluice gate on a steep slope  
 (D) A sudden drop in bed in a steep slope
66. In a standing wave flume, the depth of flow in the throat region  
 (A) Should always be greater than the critical depth  
 (B) Can be less than the critical depth  
 (C) Should be equal to the critical depth  
 (D) Is effected by the d/s depth when a jump is formed.

67. "Eddy Viscosity" means that it is  
 (A) Physical property of the fluid  
 (B) Same as the kinematic viscosity  
 (C) Always associated with laminar flow  
 (D) An apparent viscosity due to turbulent flow
68. If flow condition satisfy ' Laplace Equation' then  
 (A) Flow is rotational  
 (B) Flow does not satisfy continuity equation  
 (C) Flow is irrotational but does not satisfy continuity equation  
 (D) Flow is irrotational and satisfy continuity equation
69. Which of the following equations are used for the derivation of the differential equation for water surface profile in open channel flow?  
 1. Continuity equation      2. Energy equation      3. Momentum equation
- Select the correct answer using the codes given below  
**Codes:**  
 (A) 1, 2 and 3                      (B) 1 and 3                      (C) 1 and 2                      (D) 2 and 3
70. When no external energy is imposed, which of the following statement should be true:  
 1. Energy line always falls in the direction of flow  
 2. Hydraulic gradient line never rises in the direction of flow  
 3. Specific energy may increase or decrease in the direction of flow  
 4. Energy line and hydraulic gradient line can cross each other
- Select the correct answer using the codes given below:  
**Codes:**  
 (A) 1 and 2                      (B) 2 and 3                      (C) 3 and 4                      (D) 1 and 3
71. In a gradually varied flow, if  $dy/dx$  is positive then  $dE/dx$  will be,  
 (A) Always zero                      (B) Positive if  $y > y_c$   
 (C) Negative if  $y > y_c$                       (D) Always negative
72. The separation of boundary layer takes place when the pressure gradient is  
 (A) Negative                      (B) Positive                      (C) Zero                      (D) Constant
73. Which one of the following velocity field represents a possible fluid flow?  
 (A)  $u = x, v = y$                       (B)  $u = x^2, v = y^2$   
 (C)  $u = xy, v = x^2y^2$                       (D)  $u = x, v = -y$
74. The head loss in a pipe of diameter, carrying oil at a flow rate  $Q$  over a distance  $l$  is  $h$ . The pipe is replaced by another with half the diameter, all other things remaining the same the head loss of this case will be,  
 (A)  $0.5h$                       (B)  $2.0h$                       (C)  $8.0h$                       (D)  $32.0h$
75. The stream lines of fluid motion represents  
 (A) Lines along which velocity potential is constant  
 (B) Lines along which stream function is constant  
 (C) Lines along which vorticity is zero  
 (D) Line perpendicular to the lines along which stream function is constant

76. In a free vortex, velocity  
 (A) Decreases with radius  
 (B) Increases with radius  
 (C) Is constant  
 (D) Varies inversely as the square of the radius
77. In a V-notch an error of 0.5% in the measurement of head would constitute in the discharge measurement an error of  
 (A) 1.5% (B) 2.5% (C) 0.5% (D) 1.25%
78. The velocity distribution over one half of a cross-section is uniform and is zero over the remaining half. The momentum correction factor is  
 (A) 2.0 (B) 1.0 (C) 4.0 (D) 3.0
79. The basic equation which govern the motion of incompressible viscous fluid in laminar motion is called as  
 (A) Hagen-Poiseuille equation (B) Stokes equation  
 (C) Darcy-Weisbach equation (D) Navier-Stokes equation
80. The cavitation and pitting can be prevented by creating which one of the following conditions  
 (A) Reducing the pressure head (B) Reducing the velocity head  
 (C) Increasing elevation head (D) Reducing piezometric head
81. In the distorted model of a river the horizontal and vertical scale ratios are  $L_H$  and  $L_V$  respectively. The discharge ratio will be  
 (A)  $L_H^{1/2} L_V^2$  (B)  $L_H L_V^{3/2}$  (C)  $L_H^2 L_V^{1/2}$  (D)  $L_H^3 L_V^{-1/2}$

82. Match List I with List II and select the correct answer using the codes given below the lists:

**List I**  
**(Treatment Method)**

- A. Plain sedimentation tank  
 B. Ion-exchange  
 C. Flocculator  
 D. Rapid sand filter

**List II**  
**(Design Parameter)**

1. Hydraulic loading rate  
 2. Exhaust of bed  
 3. Settling velocity  
 4. Velocity gradient

**Codes:**

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

83. Match List I with List II and select the correct answer using the codes given below the lists:

**List I**  
**(Organism)**

- A. Bacteria  
 B. Viruses  
 C. Protozoa  
 D. Helminths

**List II**  
**(Disease transmitted)**

1. Infections Hepatitis  
 2. Amoebic dysentery  
 3. Paratyphoid  
 4. Guinea-worm infection

**Codes:**

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

84. Match List I with List II and choose the correct answer using the codes given below:

**List I**

**(Impurities)**

- A. Nitrate concentration > 45 ppm
- B. Sulphate concentration > 250 ppm
- C. Flouride concentration > 1.0 ppm
- D. Flouride concentration > 1.5 ppm

**List II**

**(Disease)**

- 1. Laxative Effect
- 2. Discoloration of teeth
- 3. Cavities in teeth
- 4. Methamogoblenemia or blue baby disease

**Codes:**

(A) A B C D  
4 1 2 3

(B) A B C D  
4 3 1 2

(C) A B C D  
1 2 3 4

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

85. Match List I with List II and select the correct answer using the codes given below:

**List I**

- A. Baylis Apparatus
- B. Tintometer
- C. Potentiometer
- D. Turbidity rod

**List II**

- 1. Field instrument of turbidity of water
- 2. Measuring instrument for pH of water
- 3. Measuring instrument for colour of water
- 4. For measuring precisely low turbidities in water

**Codes:**

(A) A B C D  
4 3 2 1

(B) A B C D  
4 2 3 1

(C) A B C D  
1 2 3 4

(D) A B C D  
1 3 2 4

86. Match List I with List II and select the correct answer using the codes given below the list:

**List I**

- A. Soil pipe
- B. Intercepting trap
- C. P-trap
- D. Cowl

**List II**

- 1. Ventilating pipe
- 2. Wash basin
- 3. Water closet waste
- 4. House drainage

**Codes:**

(A) A B C D  
3 4 1 2

(B) A B C D  
3 4 2 1

(C) A B C D  
4 3 2 1

(D) A B C D  
4 3 1 2

87. Match List I with List II and select the correct answer using the codes given below the list:

**List I**

**(Terms)**

- A. Sludge volume index
- B. Thickening of sludge
- C. Scum removal
- D. Recycling of effluent

**List II**

**(Processes)**

- 1. Settling in primary settling tank
- 2. Settling in secondary settling tank
- 3. Filtration in trickling filter
- 4. Activated sludge process

**Codes:**

(A) A B C D  
2 4 1 3

(B) A B C D  
4 2 3 1

(C) A B C D  
2 4 3 1

(D) A B C D  
4 2 1 3

88. Match List I with List II and select the correct answer using the codes given below the list:

**List I**

**(Process)**

- A. Oxidation ditch
- B. Waste stabilization pond
- C. Imhoff tank
- D. Rotating biological contractor (RBC)

**List II**

**(Biological agent)**

- 1. Facultative bacteria
- 2. Anaerobic bacteria
- 3. Aerobic bacteria (suspended culture)
- 4. Aerobic bacteria (attached culture)

Codes:

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

89. Match List I with List II and select the correct answer using the codes given below the list:

**List I**

**(Pollutants)**

- A. CO
- B. CO<sub>2</sub>
- C. SO<sub>2</sub>
- D. NO<sub>x</sub>

**List II**

**(Effect produced)**

- 1. Green house effect
- 2. Acid rain
- 3. Acute toxicity
- 4. Ozone liberation at ground level

Codes:

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

90. Area method of land filling is most suitable when

- (A) Area is unsuitable for excavation of trenches
- (B) Adequate depth of cover material is available at site
- (C) The water table is near the surface
- (D) Natural or artificial depressions exist in the vicinity

91. Under Indian conditions, the average per capita contribution of BOD is

- (A) 10 to 20 gm/d
- (B) 20 to 35 gm/d
- (C) 35 to 50 gm/d
- (D) 50 to 70 gm/d

92. Functional organization system of working was introduced by

- (A) F.W. Taylor
- (B) Henry Gantt
- (C) M.R. Walker
- (D) J.E. Kelly

93. In resource leveling

- (A) Total duration of project is reduced
- (B) Total duration of project is increased
- (C) Uniform demand of resource is achieved
- (D) Cost of project is controlled

94. Consider the following operations:

- 1. Drilling
- 2. Blasting
- 3. Mucking
- 4. Placing steel
- 5. Placing concrete

The correct sequence of these operation in tunnel construction is

- (A) 1,2,4,3,5
- (B) 1,3,2,4,5
- (C) 1,2,3,4,5
- (D) 1,3,4,2,5

95. During the construction period, price variation clause in contracts caters to:

- (A) Increase in rates of only important material
- (B) Variation in cost in materials element, labour element and petrol-oil-lubricant element
- (C) Variation in total cost of the project on an adhoc basis
- (D) Rate of inflation

96. Security deposit deducted at 5% from contractors bill is  
 (A) Refunded when the contractor has completed the work  
 (B) Refunded even before the completion of the work provided good progress has been established  
 (C) Retained till the expected life of the structure of say 100 years and spent for maintenance  
 (D) Refunded when the defect liability period at six month or one monsoon whichever in later is Over
97. Work study comprise  
 (A) Motion study (B) Work measurement  
 (C) Probabilistic analysis (D) Method study and work measurement
98. Small jobs assigned to some individuals or firms, not directly employed on the project are known as  
 (A) Sub contacts (B) Job work (C) Ancillary works (D) Miscellaneous works
99. Sinking fund is  
 (A) The fund for rebuilding a structure when its economic life is over  
 (B) Raised to meet maintenance costs  
 (C) The total sum to be paid to the municipal authorities by the tenants  
 (D) A part of the money kept in reserve for providing additional structures and structural Modification
100. Consider the following statements:  
 PERT  
 1. Takes care of uncertainties in the completion time  
 2. Requires single time estimate  
 3. Is useful for research and development oriented problem  
 4. Uses beta distribution probability cure.  
 Of these statement  
 (A) 1 and 2 are correct (B) 1, 3 and 4 are correct  
 (C) 3 and 4 are correct (D) 1,2,3 and 4 are correct