

CUET PG 2025 Civil Structural and Transport Engineering Question Paper

Time Allowed :1 Hour 45 Mins

Maximum Marks :300

Total questions :75

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The examination duration is 105 minutes. Manage your time effectively to attempt all questions within this period.
2. The total marks for this examination are 300. Aim to maximize your score by strategically answering each question.
3. There are 75 mandatory questions to be attempted in the Atmospheric Science paper. Ensure that all questions are answered.
4. Questions may appear in a shuffled order. Do not assume a fixed sequence and focus on each question as you proceed.
5. The marking of answers will be displayed as you answer. Use this feature to monitor your performance and adjust your strategy as needed.
6. You may mark questions for review and edit your answers later. Make sure to allocate time for reviewing marked questions before final submission.
7. Be aware of the detailed section and sub-section guidelines provided in the exam. Understanding these will aid in effectively navigating the exam.

1. The solution(s) of the ordinary differential equation $y'' + y = 0$, is:

- (A) $\cos x$
- (B) $\sin x$
- (C) $1 + \cos x$
- (D) $1 + \sin x$

Choose the *most appropriate* answer from the options given below:

- (A) A and D only
 - (B) A and B only
 - (C) C and D only
 - (D) B and C only
-

2. For the matrix, $A = \begin{bmatrix} -4 & 0 \\ -1.6 & 4 \end{bmatrix}$, the eigenvalues (λ) and eigenvectors (X) respectively are:

- (A) $\lambda = \begin{bmatrix} -6.0 \\ -0.5 \end{bmatrix}$, $X_1 = \begin{bmatrix} -1.2 \\ 1.4 \end{bmatrix}$, $X_2 = \begin{bmatrix} 1 \\ 0.8 \end{bmatrix}$
 - (B) $\lambda = \begin{bmatrix} -3.0 \\ -2.0 \end{bmatrix}$, $X_1 = \begin{bmatrix} 2 \\ -1.2 \end{bmatrix}$, $X_2 = \begin{bmatrix} -1.2 \\ 1.4 \end{bmatrix}$
 - (C) $\lambda = \begin{bmatrix} -2.0 \\ -1.0 \end{bmatrix}$, $X_1 = \begin{bmatrix} 1.2 \\ -1.6 \end{bmatrix}$, $X_2 = \begin{bmatrix} 0.8 \\ 1 \end{bmatrix}$
 - (D) $\lambda = \begin{bmatrix} -2.0 \\ -0.8 \end{bmatrix}$, $X_1 = \begin{bmatrix} 2 \\ -1.2 \end{bmatrix}$, $X_2 = \begin{bmatrix} 1 \\ 0.8 \end{bmatrix}$
-

3. The value of $\iint_S \vec{F} \cdot \vec{N} \, ds$ where $\vec{F} = 2x^2y\hat{i} - y^2\hat{j} + 4xz^2\hat{k}$ and S is the closed surface of the region in the first octant bounded by the cylinder $y^2 + z^2 = 9$ and the planes $x = 0, x = 2, y = 0, z = 0$, is:

- (A) 108

- (B) 72
 - (C) 180
 - (D) 144
-

4. The value of the integral $\oint_C \frac{z^3 - 6}{2z - i} dz$, where $C : |z| \leq 1$, is:

- (A) $\frac{\pi}{8} - 6\pi i$
 - (B) $\frac{\pi}{8} - 5\pi i$
 - (C) $\frac{3\pi}{8} - 5\pi i$
 - (D) $\frac{5\pi}{8} - 3\pi i$
-

5. In a Binomial distribution, the sum of its mean and variance is 1.8. If the event was conducted 5 times, then the probability of two successes is:

- (A) 0.3402
 - (B) 0.2048
 - (C) 0.1543
 - (D) 0.0564
-

6. If $f(x) = x^2$, then the second order divided difference for the points x_0, x_1, x_2 will be:

- (A) -1
 - (B) $\frac{-1}{x_1 - x_0}$
 - (C) 1
 - (D) $\frac{1}{x_2 - x_1}$
-

7. The liquid limit (LL), plastic limit (PL) and shrinkage limit (SL) of a cohesive soil satisfy the relation:

- (A) $LL > PL < SL$
 - (B) $LL > PL > SL$
 - (C) $LL < PL < SL$
 - (D) $LL < PL > SL$
-

8. In a constant head permeameter, having cross-sectional area of 20 cm^2 , when the flow was taking place under a hydraulic gradient of 0.5, the amount of water collected is 1200 cm^3 in 60 sec. The permeability of the soil is:

- (A) 0.002 cm/sec
 - (B) 0.02 cm/sec
 - (C) 0.2 cm/sec
 - (D) 2 cm/sec
-

9. To provide safety against piping failure, with a factor of safety as 3, what should be the maximum exit gradient for soil with a specific gravity of 2.5 and porosity of 0.35?

- (A) 0.155
 - (B) 0.167
 - (C) 0.325
 - (D) 0.213
-

10. If the effective stress strength parameters are $C' = -10 \text{ kPa}$ and $\phi' = 30^\circ$, the shear strength on a plane, within the saturated soil mass at a point where total normal stress is 300 kPa and pore water pressure is 150 kPa, will be:

- (A) 90.5 kPa
- (B) 96.6 kPa
- (C) 101.5 kPa
- (D) 105.5 kPa

11. From a flow-net, which of the following information can be obtained?

- A. Rate of flow
- B. Pore water pressure
- C. Exit gradient
- D. Permeability

Choose the *most appropriate* answer from the options given below:

- (A) A, B, C and D
- (B) A, B and C only
- (C) B, C and D only
- (D) A only

12. Match LIST-I with LIST-II:

LIST-I (Name of Test)		LIST-II (Used for)
A. Plate load test		I. To estimate bearing capacity of granular soil
B. Standard penetration test		II. To estimate <i>in-situ</i> strength of soft clay
C. Vane shear test		III. To identify silt from clay
D. Dilatancy test		IV. To estimate bearing capacity for permissible settlement

Choose the *most appropriate* match from the options given below:

- (A) A - IV, B - III, C - II, D - I
- (B) A - II, B - I, C - IV, D - III
- (C) A - IV, B - I, C - II, D - III
- (D) A - II, B - III, C - IV, D - I

13. To have zero active pressure intensity at the top of a wall in a cohesive soil, one should apply a uniform surcharge intensity of:

(Where C = cohesion and α = angle of failure plane with major principal plane)

- (A) $2C \tan \alpha$
 - (B) $2C \cot \alpha$
 - (C) $-2C \tan \alpha$
 - (D) $-2C \cot \alpha$
-

14. Two footings (one is circular and the other is square) are founded on the surface of a purely cohesionless soil. The diameter of the circular footing is the same as that of the side of the square footing. The ratio between ultimate bearing capacity of circular footing to that of the square footing (using Terzaghi equation) will be:

- (A) 1.0
 - (B) 1.4
 - (C) 1.3
 - (D) 0.75
-

15. For an anisotropic soil, permeability in x and y directions are k_x and k_y respectively, in a two-dimensional flow. The effective permeability (k_{eff}) for the soil is given by:

- (A) $(k_x k_y)^{1/2}$
 - (B) k_x / k_y
 - (C) $(k_x^2 + k_y^2)^{1/2}$
 - (D) $k_x + k_y$
-

16. Match LIST-I with LIST-II:

LIST-I (Type of footing/foundation)	LIST-II (Suitability)
A. Spread footings B. Friction piles C. Raft foundation D. End bearing piles	I. Soft clay for 10 m followed by hard rock stratum II. Upto 3 m black cotton soil followed by medium dense III. Compact sand deposit extending to great depth IV. Loose sand extending to great depth

Choose the *most appropriate* match from the options given below:

- (A) A - IV, B - I, C - III, D - II
(B) A - III, B - IV, C - II, D - I
(C) A - II, B - IV, C - III, D - I
(D) A - III, B - I, C - II, D - IV

17. A square pile of section $50\text{ cm} \times 50\text{ cm}$ and length 15 m penetrates a deposit of clay having $C = 5\text{ kN/m}^2$ and the adhesion factor $\alpha = 0.8$. What is the load carried by the pile through skin friction only?

- (A) 192 kN
(B) 120 kN
(C) 60 kN
(D) 48 kN

18. Which of the following statements are true?

- A. The proportioning of footing in sand is more often governed by settlement rather than by bearing capacity.
B. The pressure bulb profiles under a strip footing form as co-axially imaginable bulbs under its length.
C. Friction piles are also called as 'floating piles'.

Choose the *most appropriate* answer from the options given below:

- (A) A, B and C

- (B) A and B only
 - (C) A and C only
 - (D) B and C only
-

19. The minimum bearing capacity of a soil under a given footing occurs when the groundwater table location is at:

- (A) the base of the footing
 - (B) the ground level
 - (C) a depth equal to one-half of the width of footing
 - (D) a depth equal to the width of footing
-

20. If the dynamic viscosity of a fluid is 1.2 poise and its specific gravity is 0.8, then kinematic viscosity in SI units will be:

- (A) $9.6 \times 10^{-4} \text{ m}^2/\text{s}$
 - (B) $1.5 \times 10^{-4} \text{ m}^2/\text{s}$
 - (C) $1.5 \times 10^{-3} \text{ m}^2/\text{s}$
 - (D) $0.667 \times 10^{-4} \text{ m}^2/\text{s}$
-

21. A practical example of steady non-uniform flow is given by the:

- (A) motion of a river around bridge piers
 - (B) steadily increasing flow through a pipe
 - (C) steadily increasing flow through a reducing section
 - (D) constant discharge through a long, straight tapering pipe
-

22. Which of the following statements are true?

- A. The same Bernoulli's equation is applicable to all the points in the flow field if the flow is irrotational.

- B. The value of "Constant in the Bernoulli's equation" is different for different streamlines if the flow is rotational.
- C. When a nozzle is fitted at the end of a long pipeline, the discharge increases.
- D. The velocity of flow at the nozzle end is more than that in the case of a pipe without a nozzle, the head in both cases being the same.

Choose the *most appropriate* answer from the options given below:

- (A) A, B and D only
- (B) A, B and C only
- (C) A, B, C and D
- (D) B, C and D only
-

23. Critical depth in a channel is expressed by:

(where Q = discharge, A = Area of flow, T = top width of flow and g = acceleration due to gravity)

- (A) $\left(\frac{QA^2}{gT^3}\right) = 1$
- (B) $\left(\frac{QT^2}{gA^3}\right) = 1$
- (C) $\left(\frac{Q^2T}{gA^3}\right) = 1$
- (D) $\left(\frac{Q^2A^2}{gT^3}\right) = 1$
-

24. Reynolds number is defined as the ratio of:

- (A) Viscous force to Inertia force
- (B) Elastic force to Pressure force
- (C) Inertia force to Viscous force
- (D) Gravity force to Inertia force
-

25. The loss of head due to sudden enlargement in a pipe is expressed by: (where symbols have their usual meanings)

- (A) $\frac{(V_1^2 - V_2^2)}{2g}$
 (B) $\frac{(V_1^2 - V_2^2)}{g}$
 (C) $\frac{(V_1 - V_2)}{2g}$
 (D) $\frac{(V_1 - V_2)^2}{2g}$

26. Match LIST-I with LIST-II:

LIST-I (Flow parameter of a channel flow)	LIST-II (Proportional to)
A. Mean velocity in a Lacey regime channel	I. $S^{1/2}$
B. Mean velocity in a lined channel	II. $S^{1/3}$
C. Normal scour depth in an alluvial channel	III. $Q^{1/2}$
D. Wetted perimeter of a Lacey regime channel	IV. $Q^{2/3}$

where S is slope of channel and Q is discharge.

Choose the *most appropriate match* from the options given below:

- (A) A - I, B - II, C - III, D - IV
 (B) A - II, B - I, C - IV, D - III
 (C) A - I, B - I, C - II, D - III
 (D) A - III, B - I, C - II, D - IV

27. Water logging is caused due to:

- A. Inadequate drainage facilities
 B. Over irrigation
 C. Presence of permeable strata
 D. Seepage of water through the canals

Choose the *most appropriate* answer from the options given below:

- (A) A, B and D only
- (B) A, B and C only
- (C) A, B, C and D
- (D) B, C and D only

28. The discharge capacity required at the outlet to irrigate 2600 ha of sugarcane, having a kor depth of 17 cm and a kor period of 30 days, is:

- (A) $1.71 \text{ m}^3/\text{s}$
- (B) $2.3 \text{ m}^3/\text{s}$
- (C) $14.7 \text{ m}^3/\text{s}$
- (D) $0.18 \text{ m}^3/\text{s}$

29. Match LIST-I with LIST-II:

LIST-I (Parameter)	LIST-II (Equipment / method)
A. Stream flow velocity	I. Anemometer
B. Evapo-transpiration rate	II. Penman's method
C. Infiltration rate	III. Norton's method
D. Wind velocity	IV. Current meter

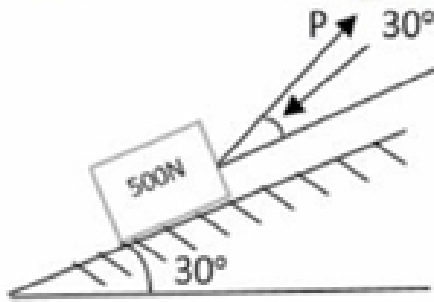
Choose the *most appropriate* match from the options given below:

- (A) A - I, B - II, C - III, D - IV
- (B) A - IV, B - III, C - II, D - I
- (C) A - IV, B - II, C - III, D - I
- (D) A - III, B - IV, C - I, D - II

30. A rectangular section has width b and depth d and a symmetrical triangular section has base b and depth d . The ratio of moment of inertia of rectangular section to that of triangular section with respect to their respective centroidal axis will be:

- (A) 1.5
- (B) 2.0
- (C) 3.0
- (D) 4.0

31. A weight of 500 N is held on a smooth plane inclined at 30° to the horizontal by a force P acting at 30° to the inclined plane as shown. Then the value of force P is:



- (A) $(500/\sqrt{3})$ N
- (B) $(500\sqrt{3})$ N
- (C) $500(\sqrt{3}/2)$ N
- (D) 250 N

32. A steel wire of 20 mm diameter is bent into a circular shape of 10 m radius. If modulus of elasticity of wire is 2×10^5 N/mm², then the maximum bending stress induced in wire is:

- (A) 100 N/mm²
- (B) 200 N/mm²
- (C) 300 N/mm²
- (D) 400 N/mm²

33. Shape of the “shear force diagram” for a simply supported beam subjected to pure moment M at the center of span, will be:



34. Which of the following statements is correct?

- (A) Shear force is the first derivative of bending moment
- (B) Shear force is the first derivative of intensity of load on the beam
- (C) Bending moment is the first derivative of shear force
- (D) Intensity of load on the beam is the first derivative of bending moment

35. Which of the following statements are correct?

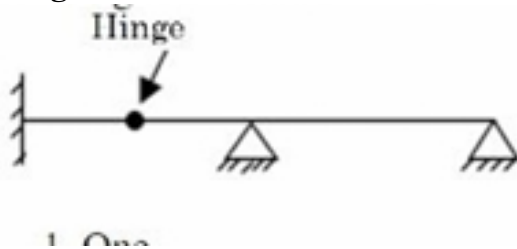
- A. Malleability is the ability of a material to absorb strain energy till the elastic limit.
- B. Toughness is the ability of a material to absorb energy till the rupture.
- C. Resilience is the area under the load deformation curve within the elastic limit.
- D. Stress-strain diagram of highly brittle material has no plastic zone.

Choose the *most appropriate* answer from the options given below:

- (A) A, B and C only

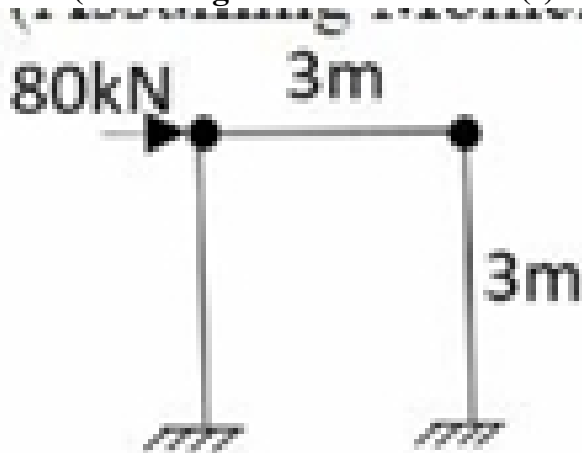
- (B) B, C and D only
- (C) A, C and D only
- (D) A, B and D only

36. The degree of static indeterminacy of the beam (as shown below) for general case of loading is:



- (A) One
- (B) Two
- (C) Three
- (D) Zero

37. For the frame shown in the figure below, the maximum moment in the left column shall be (Assuming Moment of Inertia (I) of all the members is same):



- (A) 120 kN.m
- (B) 240 kN.m
- (C) 160 kN.m

(D) Zero

38. Match LIST-I with LIST-II:

LIST-I (Assumption/ theorem)	LIST-II (Type of analysis/ strength de
A. Plane section remains plane before and after bending	I. Elastic analysis and superpos
B. Material is elastic and deformations/ deflection is small	II. Linear strain distribution
C. Uniqueness theorem	III. Non-linear analysis and buckl
D. Large deformation	IV. Collapse load

Choose the most appropriate match from the options given below:

- (A) A - I, B - II, C - III, D - IV
- (B) A - I, B - II, C - IV, D - III
- (C) A - II, B - I, C - III, D - IV
- (D) A - II, B - I, C - IV, D - III

39. The basic principle of earthquake resistant design of any structure is based on the following concept:

- (A) Weak column – Strong beam
- (B) Strong column – Weak beam
- (C) Strong column – Strong beam
- (D) Weak column – Weak beam

40. A singly reinforced rectangular concrete beam has a width of 200 mm and an effective depth of 300 mm. If the critical neutral axis depth coefficient is 0.48, then the limiting value of the moment of resistance of the beam will be close to: (Use M-20 grade of concrete and Fe-415 steel)

- (A) 30 kNm

- (B) 40 kNm
(C) 50 kNm
(D) 60 kNm

41. In limit state design of concrete structures, partial safety factors for material strength of concrete and steel respectively, are taken as:

- (A) 1.5 and 1.15
(B) 1.67 and 1.5
(C) 3 and 1.5
(D) 1.5 and 1.2

42. The time estimates obtained from four contractors (P, Q, R and S) for executing a particular job are as under:

Contractor	Optimistic time, t_o	Most likely time, t_m	Pessimistic time, t_p
P	5	10	13
Q	6	9	12
R	5	10	14
S	4	10	13

Which of these contractors is more certain about completing the job in time?

- (A) P
(B) Q
(C) R
(D) S

43. Which of the following statements (pertaining to CPM network analysis) are correct?

- A. It is an event-oriented method.

- B. It is an activity-oriented method.
- C. Time and cost are controlling factors.
- D. Time alone is the controlling factor.

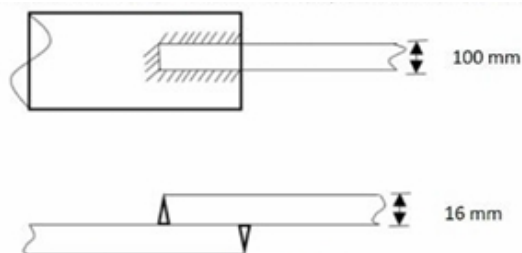
Choose the most appropriate answer from the options given below:

- (A) A and B only
- (B) A and D only
- (C) B and C only
- (D) C and D only

44. Which of the following is the “amount of time” by which the “start of an activity” may be delayed without delaying the “start of a following activity”?

- (A) Interference float
- (B) Free float
- (C) Independent float
- (D) Total float

45. A tie bar of 100 mm width and 16 mm thickness is to be welded to another plate using “8 mm fillet weld” (as shown in figure below). If the tensile capacity of plate is 240 kN and the shear stress in weld is 110.0 N/mm^2 , the minimum overlap required will be:



(Note: Figure not to the scale)

- (A) 55 mm
- (B) 75 mm
- (C) 95 mm

(D) 125 mm

46. A steel column in a multi-storeyed building carries an axial load of 125 N. It is built up of 2 ISMC 350 channels connected by lacing. The lacing will be designed to resist a transverse shear of:

- (A) 3.125 N
(B) 12.5 N
(C) 125 N
(D) 62.5 N

47. A propped cantilever of span L is subjected to a concentrated load at mid-span. If M_p is the plastic moment capacity of the beam, then the value of collapse load will be:

- (A) $\frac{12M_p}{L}$
(B) $\frac{6M_p}{L}$
(C) $\frac{8M_p}{L}$
(D) $\frac{4M_p}{L}$

48. Match LIST-I with LIST-II:

LIST-I (Type of structure)		LIST-II (Structural behavior)	
A. Truss		I. Bending	
B. Beam		II. Twisting	
C. Column		III. Shortening	
D. Shaft		IV. Buckling	

Choose the most appropriate match from the options given below:

- (1) A - III, B - II, C - I, D - IV
(2) A - III, B - I, C - II, D - IV

(3) A - II, B - I, C - IV, D - III

(4) A - III, B - I, C - IV, D - II

49. For a given road, the safe stopping sight distance (SSD) is 80 m and the passing sight distance is 300 m. What will be the intermediate sight distance?

(A) 190 m

(B) 220 m

(C) 160 m

(D) 150 m

50. A summit curve is formed at the intersection of a 3% upgrade and 5% downgrade. What is the length of the summit curve in order to provide a stopping distance of 128 m? (Assume: length of summit curve is greater than SSD, driver's eye height = 1.2 m, height of obstruction = 0.15 m).

(A) 271 m

(B) 298 m

(C) 322 m

(D) 340 m

51. For a circular curve of radius 200 m, the coefficient of lateral friction is 0.15 and the design speed is 40 kmph. The equilibrium super elevation (for equal pressure on the inner and outer wheels) would be:

(A) 6.3%

(B) 7%

(C) 4.6%

(D) 8%

52. What will be the theoretical maximum capacity for a single lane of highway, if the given speed of the traffic stream is 60 kmph and the average center-to-center spacing of the vehicle is 13.98 m?

- (A) 4391.84
- (B) 4491.84
- (C) 4591.84
- (D) 4291.84

53. Match LIST-I with LIST-II (adopting standard notations):

LIST-I (Parameter)	LIST-II (Formula)	
A. Cubic parabola equation	I. $\frac{NS^2}{4.4L^2}$	
B. Shift in transition curve	II. $\frac{24R}{NS^2}$	
C. Length of valley curve	III. $\frac{X^3}{(1.50 + 0.035S)}$	
D. Length of summit curve	IV. $\frac{6RL}{X^3}$	

Choose the most appropriate match from the options given below:

- (A) A - I, B - II, C - III, D - IV
- (B) A - III, B - IV, C - I, D - II
- (C) A - I, B - III, C - II, D - IV
- (D) A - IV, B - II, C - III, D - I

54. Which of the following parameters are required for the design of a transition curve for a highway system?

- (A) Rate of change of grade
- (B) Rate of change of radial acceleration
- (C) Rate of change of super elevation
- (D) Rate of change of curvature

Choose the most appropriate answer from the options given below:

- (A) A, B and C only
 - (B) A, B and D only
 - (C) A, C and D only
 - (D) B, C and D only
-

55. Traffic capacity is defined as:

- (A) Ability of roadway to accommodate traffic volume in terms of vehicles per hour
 - (B) Number of vehicles occupying a unit length of roadway at a given instant expressed as vehicles per km
 - (C) Capacity of the lane to accommodate the vehicles width wise (across the road)
 - (D) Maximum attainable speed of the vehicles
-

56. Bitumen grade 80/100 indicates that under the standard test conditions, the penetration value of bitumen would vary from:

- (A) 0.08 mm to 0.1 mm
 - (B) 80 mm to 100 mm
 - (C) 0.8 mm to 1 mm
 - (D) 8 mm to 10 mm
-

57. Match LIST-I with LIST-II:

LIST-I (Method)	LIST-II (Used relations)
A. Group Index Method	I. Semi-theoretical
B. CBR Method	II. Quasi-rational
C. US Navy Method	III. Empirical method using soil classification test
D. Asphalt Institute Method	IV. Empirical method using soil strength test

Choose the most appropriate match from the options given below:

- (A) A - III, B - I, C - IV, D - II
- (B) A - II, B - IV, C - I, D - III
- (C) A - III, B - IV, C - I, D - II
- (D) A - II, B - I, C - IV, D - III

58. Sequentially arrange the steps involved in laying a sewer line:

- A. Transferring the center line of the sewer to the bottom of the trench.
- B. Setting sight rails over the trench.
- C. Driving pegs to the level of the invert line of the sewer.
- D. Placing the sewer in the trench.

Choose the most appropriate answer from the options given below:

- (A) A, B, C and D
- (B) B, C, D and A
- (C) B, D, C and A
- (D) B, C, A and D

59. A sample of waste-water has 4 day 20°C B.O.D. value of 75% of the final B.O.D. The rate constant K (to the base 10) per day will be:

- (A) 0.151
- (B) 0.161
- (C) 0.171
- (D) 0.181

60. Match LIST-I with LIST-II:

LIST-I (Treatment method)	LIST-II (Principle / process involved)
A. Trickling filter	I. Symbiotic
B. Activated sludge process	II. Mechanical aeration
C. Aerated lagoon	III. Suspended growth
D. Oxidation pond	IV. Attached growth

Choose the most appropriate match from the options given below:

- (A) A - III, B - IV, C - II, D - I
 (B) A - IV, B - III, C - I, D - II
 (C) A - III, B - IV, C - I, D - II
 (D) A - IV, B - III, C - II, D - I

61. Sequentially arrange the stepwise process of wastewater treatment:

- A. Primary sedimentation
 B. Screening and Grit removal
 C. Disinfection
 D. Secondary treatment unit and Secondary Sedimentation

Choose the most appropriate answer from the options given below:

- (A) B, A, C, D
 (B) A, C, B, D
 (C) B, A, D, C
 (D) C, B, D, A

62. Match LIST-I with LIST-II:

LIST-I (Air pollutants)	LIST-II (Impact on human health)
A. Particulates	I. Impairs transport of O ₂ in the bloodstream
B. Carbon mono-oxides	II. Irritation of mucous membranes of the respiratory tract
C. Sulfur oxides	III. Cause of coughing, shortness of breath, headache etc.
D. Photochemical oxidants	IV. Cause respiratory illness

Choose the most appropriate match from the options given below:

- (A) A - II, B - I, C - IV, D - III
- (B) A - IV, B - I, C - II, D - III
- (C) A - II, B - I, C - III, D - IV
- (D) A - IV, B - III, C - II, D - I

63. A rapid sand filter for a town with a water requirement of 2 MLD is to be provided with a rate of filtration at 4000 liter/hr/m² with a backwash system. The size of the filter will be:

- (A) 19 m²
- (B) 21 m²
- (C) 23 m²
- (D) 25 m²

64. The plan of an area has shrunk such that a line originally 10 cm, now measures 9.5 cm. If the original scale of the plan was 1 cm = 10 m (R.F. = 1:1000), the shrinkage factor is given as:

- (A) 1.05
- (B) 1.0
- (C) 0.95
- (D) 0.90

65. If the declination is 5°40'W, which of the following magnetic bearings would represent the true bearing of S25°20'E?

- (A) S 19°20' E
- (B) S 31°00' E

- (C) S 20°00' E
(D) S 19°20' W
-

66. The quadrantal bearing of a line is directly observed by:

- (A) Prismatic compass
(B) Surveyor's compass
(C) Celestial observations
(D) Magnetic declination
-

67. Which of the following statements (with respect to compass traversing) are correct?

- A. True meridian at a station is constant.
B. True meridian passing through different points on the earth surface converges towards the pole.
C. The angle between the true meridian and the line is known as declination.
D. The angle between the magnetic meridian and the line is known as azimuth.

Choose the most appropriate answer from the options given below:

- (A) A and B only
(B) A and C only
(C) B and D only
(D) C and D only
-

68. The relationship between air-base (B), photographic base (b), flying height (H), and focal length of lens (f) for an aerial photograph is given by:

- (A) $B = \frac{bH}{f}$
(B) $B = \frac{fb}{H}$
(C) $B = \frac{b}{fH}$

(D) $B = \frac{b}{(H - f)}$

69. A tape (30 m long) when suspended, has a sag (dip) 'd' of 30.15 cm at the mid-span under a tension of 100 N. The total weight of the tape is given by:

- (A) 20 N
- (B) 15 N
- (C) 12 N
- (D) 8 N

70. Match LIST-I with LIST-II (Seismic Waves):

LIST-I (Type of seismic wave)	LIST-II (Characteristic of particle motion)
A. Primary Wave	III. in longitudinal direction
B. Shear Wave	IV. is perpendicular to the direction of wave propagation
C. Love Wave	I. in horizontal plane and transverse to the direction of wave propagation
D. Rayleigh Wave	II. in vertical plane and retrograde

- (A) A - I, B - II, C - III, D - IV
- (B) A - I, B - III, C - II, D - IV
- (C) A - I, B - II, C - IV, D - III
- (D) A - III, B - IV, C - I, D - II

71. If the velocity of the shear wave through a soil deposit is determined as V_s , the shear modulus 'G' is given as: (where, ρ = mass density of soil)

- (A) ρV
- (B) $\frac{\rho}{V_s}$
- (C) ρV_s^2
- (D) $(\rho V_s)^{1/2}$

72. Which of the following computer programs is based on the one-dimensional wave propagation method and used to compute the responses for a design motion?

- (A) ETAB
- (B) SHAKE
- (C) STAAD
- (D) PLAXIS

73. Which of the following factors does not affect strong ground motion?

- (A) Wave types
- (B) Site conditions
- (C) Distance from epicenter
- (D) Type of structure

74. Which of the following statements (with regard to earth pressure) are correct?

- A. Any movement of the retaining wall away from the fill corresponds to active earth pressure.
- B. Under earthquake loading, the pore pressure decreases in saturated silty soil.
- C. Coulomb's earth pressure theory does not take the roughness of wall into consideration.
- D. Rankine's earth pressure theory considers that the retaining wall has a vertical backfill.

- (A) A and B only
- (B) B and C only
- (C) A and D only
- (D) C and D only

75. Sequentially arrange the reactions of observers and type of damage during an earthquake in the increasing order of earthquake intensity measured at Modified Mercalli Intensity (MMI) Scale.

A. Earthquake is felt quite noticeably indoors, especially on upper floors of buildings.

Damage: No damage. Standing motor cars may rock slightly.

B. Everyone runs outdoors. Noticed by persons driving motor cars. Damage: Considerable damage in poorly built or badly designed structures.

C. Earthquake is not felt except by a few people under especially favorable circumstances.

Damage: No damage.

D. Earthquake is felt by nearly everyone, many awakened. Damage: Some dishes, windows broken, few cracks in plaster, unstable objects overturned.

(A) A, B, C, D

(B) C, A, D, B

(C) B, A, D, C

(D) C, B, D, A