

**GATE-2011**

**Question Paper**

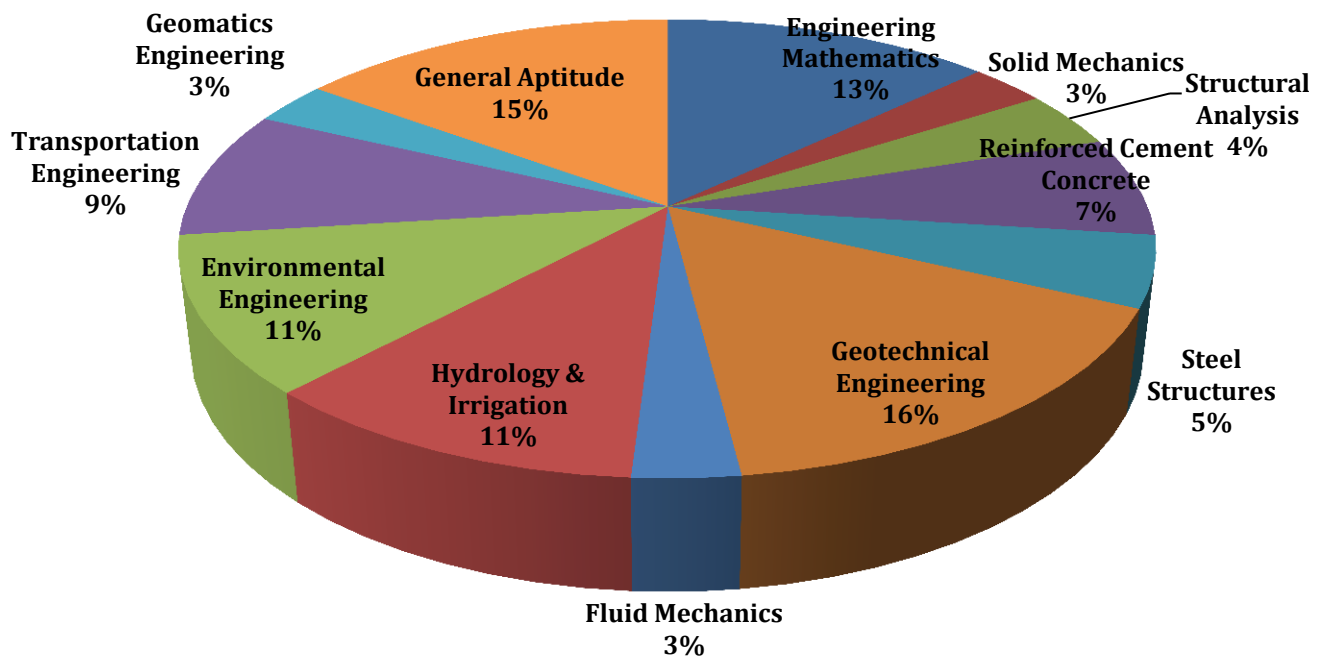
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**Answer Keys**

# Index

1. Question Paper Analysis
2. Question Paper & Answer keys

# ANALYSIS OF GATE 2011 Civil Engineering



**GATE-2011- CE**

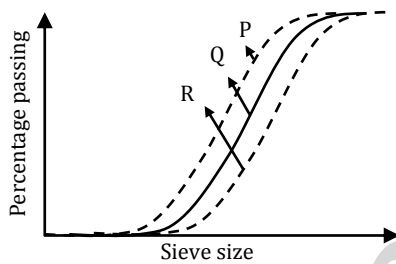
<b>SUBJECT</b>	<b>NO OF QUESTION</b>	<b>Topics Asked in Paper</b>	<b>Total Marks</b>
Engineering Mathematics	1 M: 3 2 M: 5	Linear Algebra, Numerical Methods Probability and Distribution, Complex Variables Calculus, Differential Equations	13
Solid Mechanics	1 M: 1 2 M: 1	Shear Force and Bending Moment Torsion	3
Structural Analysis	1 M: 0 2 M: 2	Slope and Deflection Method	4
Reinforced Cement Concrete	1 M: 3 2 M: 2	Basic of Mix Design Concrete Technology Analysis of Ultimate Load Capacity	7
Steel Structures	1 M:1 2 M:2	Welded Connections, Plastic Analysis Beams	5
Geotechnical Engineering	1 M: 6 2 M: 5	Index Properties and Soil Classification Permeability and Seepage, Bearing Capacity Shear Strength, Stress Analysis, Pile Foundation Consolidation, Shear Strength	16
Fluid Mechanics	1 M: 1 2 M: 1	Fluid Statics Flow Through Pipes	3
Hydrology & Irrigation	1 M: 3 2 M: 4	Hydrology Open Channel Flow	11
Environmental Engineering	1 M: 3 2 M: 4	Water Supply and its Treatment Quality Standards of Water Air Pollution and Noise Pollution Sludge Disposal	11
Transportation Engineering	1 M: 3 2 M: 3	Traffic Characteristics Geometric Design of Highway Testing and Specifications of Paving Materials Traffic Characteristics Geometric Design of Highway Intersection Design	9
Geomatics Engineering	1 M: 1 2 M: 1	Leveling Theodolite & Traversing	3
General Aptitude	1 M: 5 2 M: 5	Numerical Ability Verbal Ability	15
<b>Total</b>	<b>65</b>		<b>100</b>



6. Consider a reinforcing bar embedded in concrete. In a marine environment this bar undergoes uniform corrosion, which leads to deposition of corrosion products on its surface and an increase in apparent volume of the bar. This subjects the surrounding concrete to expansive pressure. As a result, corrosion cracks appear at surface of concrete. Which of the following statement is true?
- (A) Corrosion causes circumferential tensile stress in concrete and the cracks will be parallel to corroded reinforcing bar.
- (B) Corrosion causes radial tensile stresses in concrete and cracks will be parallel to corroded reinforcing bar.
- (C) Corrosion causes circumferential tensile stresses in concrete and cracks will be perpendicular to the direction corroded reinforcing bar.
- (D) Corrosion causes radial tensile stresses in concrete and cracks will be perpendicular to direction of the corroded reinforcing bar.

**[Ans. C]**

7. The results for sieve analysis carried out for three types of sand, P, Q and R, are given in the adjoining figure. If the fineness modulus values of the three sands are given as  $FM_P$ ,  $FM_Q$  and  $FM_R$  it can be stated that



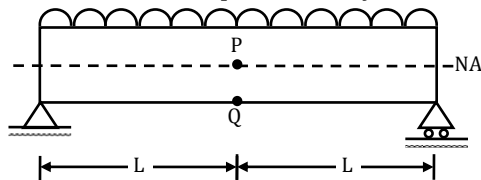
- (A)  $FM_Q = \sqrt{FM_P \times FM_R}$
- (B)  $FM_Q = 0.5 (FM_P + FM_R)$
- (C)  $FM_P > FM_Q > FM_R$
- (D)  $FM_P < FM_Q < FM_R$

**[Ans. A]**

8. The cross-section of a thermo-mechanically treated (TMT) reinforcing bar has
- (A) Soft ferrite-pearlite throughout.
- (B) Hard martensite throughout
- (C) A soft ferrite-pearlite core with a hard martensitic rim.
- (D) A hard martensitic core with a soft pearlite-bainitic rim.

**[Ans. C]**

9. Consider a simply supported beam with a uniformly distributed load having a neutral axis (NA) as shown. For points P (on the neutral axis) and Q (at the bottom of the beam) the state of stress is best represented by which of the following pairs?





[Ans. \*]

10. For a saturated sand deposit, the void ratio and the specific gravity of solids are 0.70 and 2.67, respectively. The critical (upward) hydraulic gradient for the deposit would be

(A) 0.54 (C) 1.02  
(B) 0.98 (D) 1.87

[Ans. B]

11. Likelihood of general shear failure for an isolated footing in sand decreases with

(A) Decreasing footing depth  
(B) Decreasing inter-granular packing of the sand  
(C) Increasing footing width  
(D) Decreasing soil grain compressibility

[Ans. B]

12. For a sample of dry, cohesionless soil with friction angle,  $\phi$ , the failure plane will be inclined to the major principal plane by an angle equal to

(A)  $\phi$  (C)  $45^\circ - \phi/2$   
(B)  $45^\circ$  (D)  $45^\circ + \phi/2$

[Ans. D]

13. Two geometrically identical isolated footings, X (linear elastic) and Y (rigid), are loaded identically (shown below). The soil reaction will



(A) Be uniformly distributed for Y but not for X  
(B) Be uniformly distributed for X but not for Y  
(C) Be uniformly distributed for both X and Y  
(D) Not be uniformly distributed for both X and Y

[Ans. A]

14. A soil is composed of solid spherical grains of identical specific gravity and diameter between 0.075mm and 0.0075mm. If the terminal velocity of the largest particle falling through water without flocculation is 0.5 mm/s, that for the smallest particle would be  
(E) 0.005 mm/s (G) 5 mm/s  
(F) 0.05 mm/s (H) 50 mm/s  
**[Ans. A]**
15. A watershed got transformed from rural to urban over a period of time. The effect of urbanization on storm runoff hydrograph from the watershed is to  
(A) Decrease the volume of runoff  
(B) Increase the time to peak discharge  
(C) Decrease the time base  
(D) Decrease the peak discharge  
**[Ans. C]**
16. For given discharge, the critical flow depth in an open channel depends on  
(A) Channel geometry only  
(B) Channel geometry and bed slope  
(C) Channel geometry, bed slope and roughness  
(D) Channel geometry, bed slope, roughness and Reynolds number  
**[Ans. A]**
17. For a body completely submerged in a fluid, the centre of gravity (G) and centre of Buoyancy (O) are known. The body is considered to be in stable equilibrium is  
(A) O does not coincide with the centre of mass of the displaced fluid  
(B) G coincides with the centre of mass of the displaced fluid  
(C) O lies below G  
(D) O lies above G  
**[Ans. D]**
18. The flow in a horizontal, frictionless rectangular open channel is supercritical. A smooth hump is built on the channel floor. As the height of hump is increased, choked condition is attained. With further increase in the height of the hump, the water surface will  
(A) Rise at a section upstream of the hump  
(B) Drop at a section upstream of the hump  
(C) Drop at the hump  
(D) Rise at the hump  
**[Ans. B]**
19. Consider the following unit processes commonly used in water treatment; rapid mixing (RM), flocculation (F), primary sedimentation (PS), secondary sedimentation (SS), chlorination (C) and rapid sand filtration (RSF). The order of these unit processes (first to last) in a conventional water treatment plant is  
(A) PS → RSF → F → RM → SS → C (C) PS → F → SS → RSF → RM → C  
(B) PS → F → RM → RSF → SS → C (D) PS → RM → F → SS → RSF → C  
**[Ans. D]**



20. Anaerobically treated effluent has MPN of total coliform as  $10^6/100\text{mL}$ . After chlorination, the MPN value declines to  $10^2/100\text{mL}$ . The percent removal (%R) and log removal (log R) of total coliform MPN is
- (A) (%R) = 99.90; log R = 4  
(B) (%R) = 99.90; log R = 2  
(C) (%R) = 99.99; log R = 4  
(D) (%R) = 99.99; log R = 2

[Ans. C]

21. Consider four common air pollutants found in urban environment, NO, SO<sub>2</sub>, Soot and O<sub>3</sub>. Among these which one is the secondary air pollutant?
- (A) O<sub>3</sub>  
(B) NO  
(C) SO<sub>2</sub>  
(D) Soot

[Ans. A]

22. The probability that k number of vehicles arrive (i.e. cross a predefined line) in time t is given as  $(\lambda t)^k e^{-\lambda t} / k!$ , where  $\lambda$  is the average vehicle arrival rate. What is the probability that the time headway is greater than or equal to time  $t_1$ ?
- (A)  $\lambda e^{\lambda t_1}$   
(B)  $\lambda e^{-t_1}$   
(C)  $e^{\lambda t_1}$   
(D)  $e^{-\lambda t_1}$

[Ans. D]

23. A vehicle negotiates a transition curve with uniform speed v. If the radius of the horizontal curve and the allowable jerk are R and J, respectively, the minimum length of the transition curve is
- (A)  $R^3/(vJ)$   
(B)  $J^3/(Rv)$   
(C)  $v^2R/J$   
(D)  $v^3/(RJ)$

[Ans. D]

24. In marshal testing of bituminous mixes, as the bitumen content increases the flow value
- (A) Remains constant  
(B) Decreases first and then increases  
(C) Increase monotonically  
(D) Increases first and then decreases

[Ans. C]

25. Curvature correction to a staff reading in a differential leveling survey is
- (A) Always subtractive  
(B) Always zero  
(C) Always additive  
(D) Dependent on latitude

[Ans. D]

**Q.26 - Q.55 Carry Two Mark each.**

26. For an analytic function,  $f(x + iy) = u(x, y) + iv(x, y)$ , u is given by  $u = 3x^2 - 3y^2$ . The expression for v considering K to be a constant is
- (A)  $3y^2 - 3x^2 + k$   
(B)  $6y - 6x + k$   
(C)  $6x - 6y + k$   
(D)  $6xy + k$

[Ans. D]

27. What should be the value of  $\lambda$  such that the function defined below is continuous at  $x = \pi/2$ ?

$$f(x) = \begin{cases} \frac{\lambda \cos x}{\frac{\pi}{2} - x} & \text{if } x \neq \pi/2 \\ 1 & \text{if } x = \pi/2 \end{cases}$$

- (A) 0 (C) 1  
(B)  $2/\pi$  (D)  $\pi/2$

[Ans. C]

28. What is the value of the definite integral

$$\int_0^a \frac{\sqrt{x}}{\sqrt{x} + \sqrt{a-x}} dx?$$

- (A) 0 (C) a  
(B)  $a/2$  (D)  $2a$

[Ans. B]

29. If  $\vec{a}$  and  $\vec{b}$  are two arbitrary vectors with magnitudes  $a$  and  $b$  respectively.  $|\vec{a} \times \vec{b}|^2$  will be equal to

- (A)  $a^2b^2 - (\vec{a} \cdot \vec{b})^2$  (C)  $a^2b^2 + (\vec{a} \cdot \vec{b})^2$   
(B)  $ab - \vec{a} \cdot \vec{b}$  (D)  $ab + \vec{a} \cdot \vec{b}$

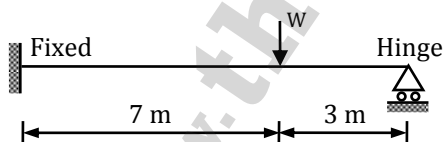
[Ans. A]

30. The solution of the differential equation  $\frac{dy}{dx} + \frac{y}{x} = x$ , with the condition that  $y = 1$  at  $x = 1$ , is

- (A)  $y = \frac{2}{3x^2} + \frac{x}{3}$  (C)  $y = \frac{2}{3} + \frac{x}{3}$   
(B)  $y = \frac{x}{2} + \frac{1}{2x}$  (D)  $y = \frac{2}{3x} + \frac{x^2}{3}$

[Ans. D]

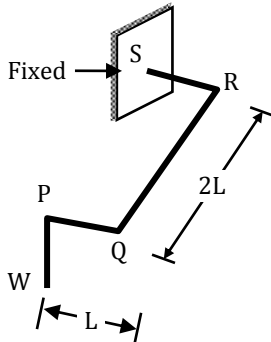
31. The value of  $W$  that results in the collapse of the beam shown in the adjoining figure and having a plastic moment capacity of  $M_p$  is



- (A)  $(4/21) M_p$  (C)  $(7/21) M_p$   
(B)  $(3/10) M_p$  (D)  $(13/21) M_p$

[Ans. D]

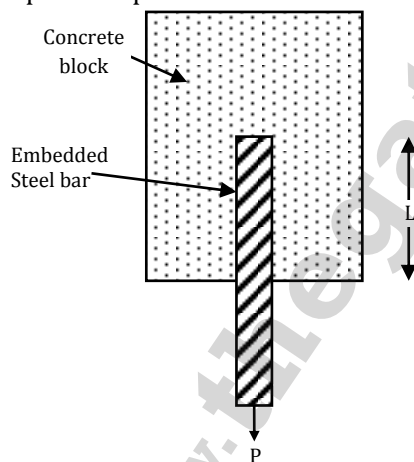
32. For the cantilever bracket, PQRS, loaded as shown in the adjoining figure ( $PQ = RS = L$  and  $QR = 2L$ ) which of the following statements is FALSE?



- (A) The portion RS has a constant twisting moment with a value of  $2WL$   
 (B) The portion QR has a varying twisting moment with a maximum value of  $WL$   
 (C) The portion PQ has a varying bending moment with a maximum value of  $WL$   
 (D) The portion PQ has no twisting moment

[Ans. B]

33. Consider a bar of diameter  $D$  embedded in a large concrete block as shown in the adjoining figure, with a pull out force  $P$  being applied. Let  $\sigma_b$  and  $\sigma_{st}$  be the bond strength (between the bar and concrete) and the tensile strength of the bar, respectively. If the block is held in position and it is assumed that the material of block does not fail, which of the following options represents the maximum value of  $P$ ?



- (A) Maximum of  $\left(\frac{\pi}{4} D^2 \sigma_b\right)$  and  $(\pi D L \sigma_{st})$   
 (B) Maximum of  $\left(\frac{\pi}{4} D^2 \sigma_{st}\right)$  and  $(\pi D L \sigma_b)$   
 (C) Minimum of  $\left(\frac{\pi}{4} D^2 \sigma_{st}\right)$  and  $(\pi D L \sigma_b)$   
 (D) Minimum of  $\left(\frac{\pi}{4} D^2 \sigma_b\right)$  and  $(\pi D L \sigma_{st})$

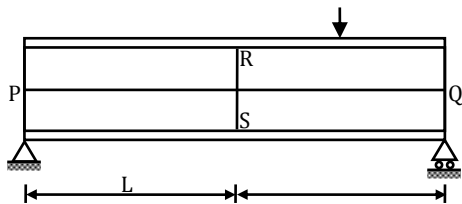
[Ans. C]

34. Consider two RCC beams, P and Q, each having the section  $400 \text{ mm} \times 750 \text{ mm}$  (effective depth,  $d = 750 \text{ mm}$ ) Made with concrete having a  $\tau_{cmax} = 2.1 \text{ N/mm}^2$ . For the reinforcement provided and the grade of concrete used, it may be assumed that the  $\tau_c = 0.75 \text{ N/mm}^2$ . The design shear in beam P is  $400 \text{ kN}$  and in beam Q is  $750 \text{ kN}$ . Considering the provisions of IS:456-2000, which of the following statements is true?

- (A) Shear reinforcement should be designed for 175 kN for beam P and the section for beam Q should be revised.
- (B) Nominal shear reinforcement is required for beam P & shear reinforcement should be designed for 120kN for beam Q
- (C) Shear reinforcement should be designed for 175kN for beam P and shear reinforcement should be designed for 525 kN for beam Q
- (D) The sections for both beams P & Q need to be revised.

**[Ans. A]**

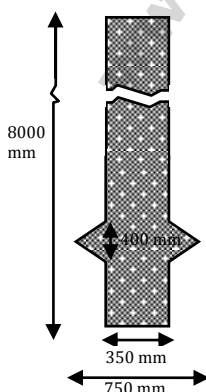
35. The adjoining figure shows a schematic representation of a steel plate girder to be used as a simply supported beam with a concentrated load. For stiffeners, PQ (running along the beam axis) and RS (running between the top and bottom flanges) which of the following pairs of statements will be TRUE?



- (A) (i) RS should be provided under the concentrated load only  
(ii) PQ should be placed in the tension side of the flange
- (B) (i) RS helps to prevent local buckling of the web  
(ii) PQ should be placed in the compression side of the flange.
- (C) (i) RS should be provided at supports  
(ii) PQ should be placed along the neutral axis
- (D) (i) RS should be provided away from points of action of concentrated loads  
(ii) PQ should be provided on the compression side of the flange

**[Ans. B]**

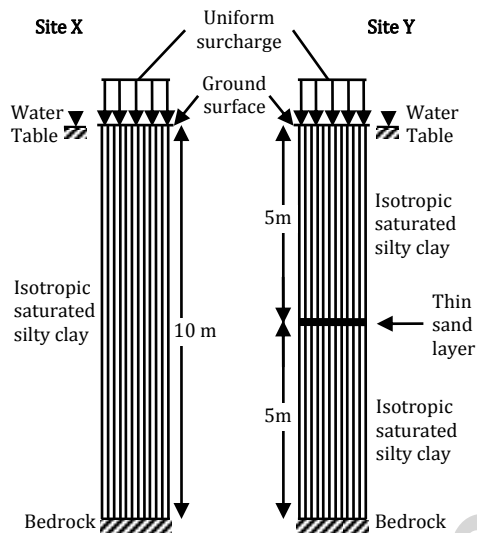
36. A singly under-reamed, 8-m long, RCC pile (shown in the adjoining figure) weighing 20 kN with 350 mm shaft diameter and 750 mm under-ream diameter is installed within stiff, saturated silty clay (undrained shear strength is 50 kPa, adhesion factor is 0.3, and the applicable bearing capacity factor is 9) to counteract the impact of soil swelling on a structure constructed above. Neglecting suction and the contribution of the under-ream to the adhesive shaft capacity, what would be the estimated ultimate tensile capacity (rounded off to the nearest integer value of kN) of the pile?



- (A) 132 kN (C) 287 kN  
(B) 156 kN (D) 301 kN

[Ans. B]

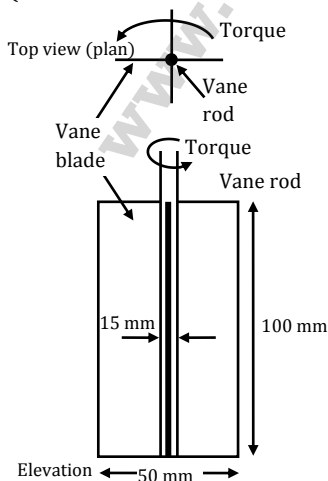
37. Identical surcharges are placed at ground surface at sites X and Y, with soil conditions shown alongside and water table at ground surface. The silty clay layers at X and Y are identical. The thin sand layer at Y is continuous and free-draining with a very large discharge capacity. If primary consolidation at X is estimated to complete in 36 months, what would be the corresponding time of completion of primary consolidation at Y?



- (A) 2.25 months (C) 9 months  
(B) 4.5 months (D) 36 months

[Ans. C]

38. A field vane testing instrument (shown alongside) was inserted completely into a deposit of soft, saturated silty clay with the vane rod vertical such that the top of the blades were 500 mm below the ground surface. Upon application of a rapidly increasing torque about the vane rod, the soil was found to fail when the torque reached 4.6 Nm. Assuming mobilization of undrained shear strength on all failure surfaces to be uniform and the resistance mobilized on the surface of the vane rod to be negligible, what would be the peak undrained shear strength (rounded off to the nearest integer value of kPa) of the soil?



- (A) 5 kPa (C) 15 kPa  
(B) 10 kPa (D) 20 kPa

**[Ans. B]**

39. A single pipe of length 1500 m and diameter 60 cm connect two reservoirs having a difference of 20m in their water levels. The pipe is to be replaced by two pipes of the same length and equal diameter 'd' to convey 25% more discharge under the same head loss. If the friction factor is assumed to be the same for all the pipes, the value of 'd' is approximately equal to which of the following options ?

- (A) 37.5 cm (C) 45.0 cm  
(B) 40.0 cm (D) 50.0 cm

**[Ans. D]**

40. A spill way discharges flood flow at a rate of  $9\text{m}^3/\text{s}$  per metre width. If the depth of flow on the horizontal apron at the toe of the spillway is 46 cm, the tail water depth needed to form a hydraulic jump is approximately given by which of the following options?

- (A) 2.54 m (C) 5.77 m  
(B) 4.90 m (D) 6.23 m

**[Ans. C]**

41. In an aquifer extending over 150 hectare, the water table was 20 m below ground level. Over a period of time the water table dropped to 23 m below the ground level. If the porosity of aquifer is 0.40 and the specific retention is 0.15, what is the change in ground water storage of aquifer?

- (A) 67.5 ha.m (C) 180 ha.m  
(B) 112.5 ha.m (D) 450 ha.m

**[Ans. B]**

42. Total suspended particulate matter (TSP) concentration in ambient air is to be measured using a high volume sampler. The filter used for this purpose had an initial dry weight of 9.787 g. The filter was mounted in the sampler and the initial air flow rate through the filter was set at  $1.5\text{m}^3/\text{min}$ . Sampling continued for 24 hours. The airflow after 24 hours was measured to be  $1.4\text{m}^3/\text{min}$ . The dry weight of the filter paper after 24 hour sampling was 10.283 g. Assuming a linear decline in the air flow rate during sampling, what is the 24 hour average TSP concentration in the ambient. Air?

- (A)  $59.2\mu\text{g}/\text{m}^3$ . (C)  $237.5\mu\text{g}/\text{m}^3$ .  
(B)  $118.6\mu\text{g}/\text{m}^3$ . (D)  $574.4\mu\text{g}/\text{m}^3$ .

**[Ans. C]**

43. Chlorine gas ( $8\text{mg}/\text{L}$  as  $\text{Cl}_2$ ) was added to a drinking water sample. If the free chlorine residual and pH was measured to be  $2\text{mg}/\text{L}$  (as  $\text{Cl}_2$ ) and 7.5, respectively, what is the concentration of residual  $\text{OCl}^-$  ions in the water? Assume that the chlorine gas added to the water is completely converted to  $\text{HOCl}$  and  $\text{OCl}^-$ . Atomic Weight of Cl: 35.5

Given  $\text{OCl}^- + \text{H}^+ \rightleftharpoons \text{HOCl}$ ,  $K = 10^{7.5}$

- (A)  $1.408 \times 10^{-5}$  moles/L (C)  $5.634 \times 10^{-5}$  moles/L  
(B)  $2.817 \times 10^{-5}$  moles/L (D)  $1.127 \times 10^{-4}$  moles/L

**[Ans. B]**

44. If the jam density given as  $k_j$  and the free flow speed is given as  $u_f$  the maximum flow for a linear traffic speed density model is given by which of the following options?

- (A)  $\frac{1}{4}k_j \times u_f$  (C)  $\frac{3}{5}k_j \times u_f$   
(B)  $\frac{1}{3}k_j \times u_f$  (D)  $\frac{2}{3}k_j \times u_f$

[Ans. A]

45. If  $v$  is the initial speed of a vehicle,  $g$  is the gravitational acceleration,  $G$  is the upward longitudinal slope of the road and  $f_r$  is the coefficient of rolling friction during braking, the braking distance (measured horizontally) for the vehicle to stop is

- (A)  $\frac{v^2}{g(G + f_r)}$  (C)  $\frac{vg}{(G + f_r)}$   
(B)  $\frac{v^2}{2g(G + f_r)}$  (D)  $\frac{vf_r}{(G + g)}$

[Ans. B]

46. The observations from a closed loop traverse around an obstacle are

Segment	Observation from station	Length (m)	Azimuth (clockwise from magnetic north)
PQ	P	Missing	33.7500°
QR	Q	300.00	86.3847°
RS	R	354.524	169.3819°
ST	S	450.000	243.9003°
TP	T	268.000	317.5000°

What is the value of the missing measurement (rounded off to the nearest 10 mm)?

- (A) 396.86 m (C) 396.05 m  
(B) 396.79 m (D) 396.94 m

[Ans. B]

**Common Data Questions**

**Common Data for Questions 48 and 49**

A sand layer found at sea floor under 20 m water depth is characterized with relative density = 40%. Maximum void ratio = 1.0, minimum void ratio = 0.5, and specific gravity of soil solids = 2.67. Assume the specific gravity of sea water to be 1.03 and the unit weight of fresh water to be 9.81 kN/m<sup>3</sup>

47. What would be the effective stress (rounded off to the nearest integer value of kPa) at 30 m depth into the sand layer?

- (A) 77 kPa (C) 268 kPa  
(B) 273 kPa (D) 281 kPa

[Ans. D]

48. What would be the change in the effective stress (rounded off to the nearest integer value of kPa) at 30 m depth into the sand layer if the sea water level permanently rises by 2 m?
- (A) 19 kPa (C) 21 kPa  
(B) 0 kPa (D) 22 kPa

[Ans. B]

**Common Data for Questions 50 and 51**

The ordinates of 2-h unit hydrograph at 1 hour intervals starting from time  $t = 0$ , are 0, 3, 8, 6, 3, 2 and 0  $\text{m}^3/\text{s}$ . Use trapezoidal rule for numerical integration, is required.

49. What is the catchment area represented by the unit hydrograph?
- (A) 1.00  $\text{km}^2$  (C) 7.92  $\text{km}^2$   
(B) 2.00  $\text{km}^2$  (D) 8.64  $\text{km}^2$

[Ans. C]

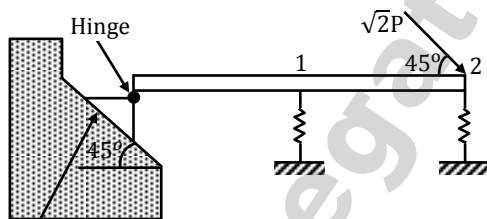
50. A storm of 6.6 cm occurs uniformly over the catchment in 3 hours. If  $\phi$ -index is equal to 2mm/h and base flow is 5  $\text{m}^3/\text{s}$ , what is the peak flow due to the storm?
- (A) 41.0  $\text{m}^3/\text{s}$  (C) 53.0  $\text{m}^3/\text{s}$   
(B) 43.4  $\text{m}^3/\text{s}$  (D) 56.2  $\text{m}^3/\text{s}$

[Ans. A] (Required confirmation)

**Linked Answer Questions**

**Statement for Linked Answer Questions 52 and 53**

A rigid beam is hinged at one end and supported on linear elastic springs (both having a stiffness of 'k') at points '1' and '2', and an inclined load acts at '2', as shown.



Fixed

51. Which of the following options represents the deflections  $\delta_1$  and  $\delta_2$  at points '1' & '2'?
- (A)  $\delta_1 = \frac{2}{5} \left( \frac{2P}{k} \right)$  and  $\delta_2 = \frac{4}{5} \left( \frac{2P}{5} \right)$  (C)  $\delta_1 = \frac{2}{5} \left( \frac{P}{\sqrt{2}k} \right)$  and  $\delta_2 = \frac{4}{5} \left( \frac{P}{\sqrt{2}k} \right)$   
(B)  $\delta_1 = \frac{2}{5} \left( \frac{P}{k} \right)$  and  $\delta_2 = \frac{4}{5} \left( \frac{P}{k} \right)$  (D)  $\delta_1 = \frac{2}{5} \left( \frac{\sqrt{2}P}{k} \right)$  and  $\delta_2 = \frac{4}{5} \left( \frac{\sqrt{2}P}{k} \right)$

[Ans. B]

52. If the load P equals 100 kN, which of the following options represents forces  $R_1$  and  $R_2$  in the springs at points '1' and '2'?
- (A)  $R_1 = 20$  kN and  $R_2 = 40$  kN (C)  $R_1 = 30$  kN and  $R_2 = 60$  kN  
(B)  $R_1 = 50$  kN and  $R_2 = 50$  kN (D)  $R_1 = 40$  kN and  $R_2 = 80$  kN

[Ans. D]



**Statement for Linked Answer Questions 54 and 55**

The sludge from the aeration tank of the activated sludge process (ASP) has solids content (by weight) of 2%. This sludge is put in a sludge thickener, where sludge volume is reduced to half. Assume that the amount of solids in the supernatant from the thickener is negligible, the specific gravity of sludge solids is 2.2 and the density is  $1000 \text{ kg/m}^3$

53. What is the density of the sludge removed from the aeration tank?  
 (A)  $990 \text{ kg/m}^3$  (C)  $1011 \text{ kg/m}^3$   
 (B)  $1000 \text{ kg/m}^3$  (D)  $1022 \text{ kg/m}^3$

**[Ans. C]**

54. What is the solids content (by weight) of the thickened sludge?  
 (A) 3.96% (C) 4.04%  
 (B) 4.00% (D) 4.10%

**[Ans. A]**

**General Aptitude One Marks Question Q. 56 to Q. 60**

56. If  $\text{Log}(P) = (1/2)$   $\text{Log}(Q) = (1/3)$   
 $\text{Log}(R)$ , then which of the following options is TRUE?  
 (A)  $P^2 = Q^3R^2$  (C)  $Q^2 = R^3P$   
 (B)  $Q^2 = PR$  (D)  $R = P^2Q^2$

**[Ans. B]**

57. Which of the following options is the closest in the meaning to the word below:  
 Inexplicable  
 (A) Incomprehensible (C) Inextricable  
 (B) Indelible (D) Infallible

**[Ans. A]**

58. Choose the word from the options given below that is most nearly opposite in meaning to the given word:  
 Amalgamate  
 (A) merge (C) collect  
 (B) split (D) separate

**[Ans. D]**

59. Choose the most appropriate word from the options given below to complete the following sentence. If you are trying to make a strong impression on your audience, you cannot do so by being understated, tentative or  
 (A) hyperbolic (C) argumentative  
 (B) restrained (D) indifferent

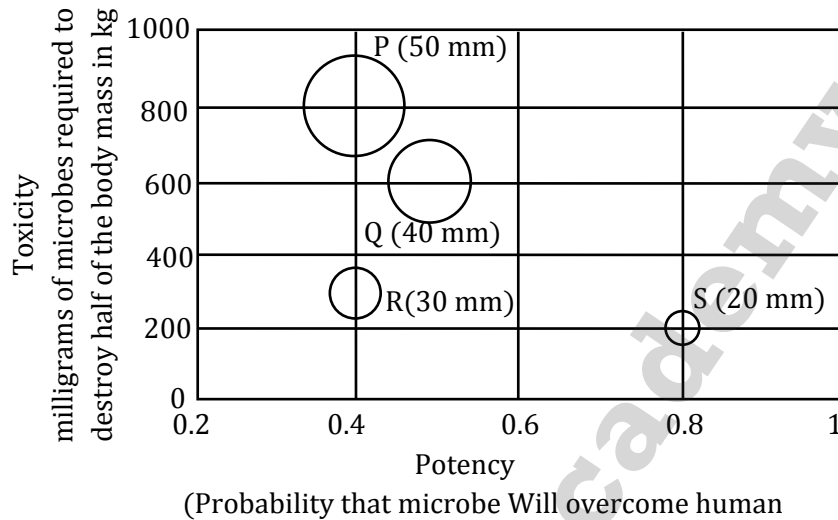
**[Ans. B]**

60. Choose the most appropriate word(s) from the options given below to complete the following sentence.  
 I contemplated Singapore for my vacation but decided against it.  
 (A) to visit (C) visiting  
 (B) having to visit (D) for a visit

**[Ans. C]**

**General Aptitude Two Marks Question Q. 61 to Q. 65**

61. P, Q, R and S are four types of dangerous microbes recently found in a human habitat. The area of each circle with its diameter printed in brackets represents the growth of a single microbe surviving human immunity system within 24 hours of entering the body. The danger to human beings varies proportionately with the toxicity, potency and growth attributed to a microbe shown in the figure



A pharmaceutical company is contemplating the development of a vaccine against the most dangerous microbe. Which microbe should the company target in its first attempt?

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

**[Ans. A]**

62. Few school curricula include a unit on how to deal with bereavement and grief, and yet all the students at some point in their lives suffer from losses through death and parting. Based on the above passage which topic would not be included in a unit on bereavement?
- (A) How to write a letter of condolence  
 (B) What emotional stages are passed through in the healing process  
 (C) What the leading causes of death are  
 (D) How to give support to a grieving friend

**[Ans. C]**

63. A container originally contains 10 litres of pure spirit. From this container 1 litre of spirit is replaced with 1 litre of water. Subsequently, 1 litre of the mixture is again replaced with 1 litre of water and this process is repeated one more time. How much spirit is now left in the container?
- (A) 7.58 litres (C) 7 litres  
 (B) 7.84 litres (D) 7.29 litres

**[Ans. D]**

64. A transporter receives the same number of orders each day. Currently, he has some pending orders (backlog) to be shipped. If he uses 7 trucks, then at the end of the 4th day he can clear all the order. Alternatively, if he uses only 3 trucks, then all the orders are cleared at the end of the 10th day. What is the minimum number of trucks required so that there will be no pending order at the end of the 5th day?

(A) 4 (C) 6  
(B) 5 (D) 7

**[Ans. C]**

65. The variable cost (V) of manufacturing a product varies according to the equation  $V = 4q$ , where q is the quantity produced. The fixed cost (F) of production of same product reduces with q according to the equation  $F = 100/q$ . How many units should be produced to minimize the total cost (V+F)?

(A) 5 (C) 7  
(B) 4 (D) 6

**[Ans. B]**