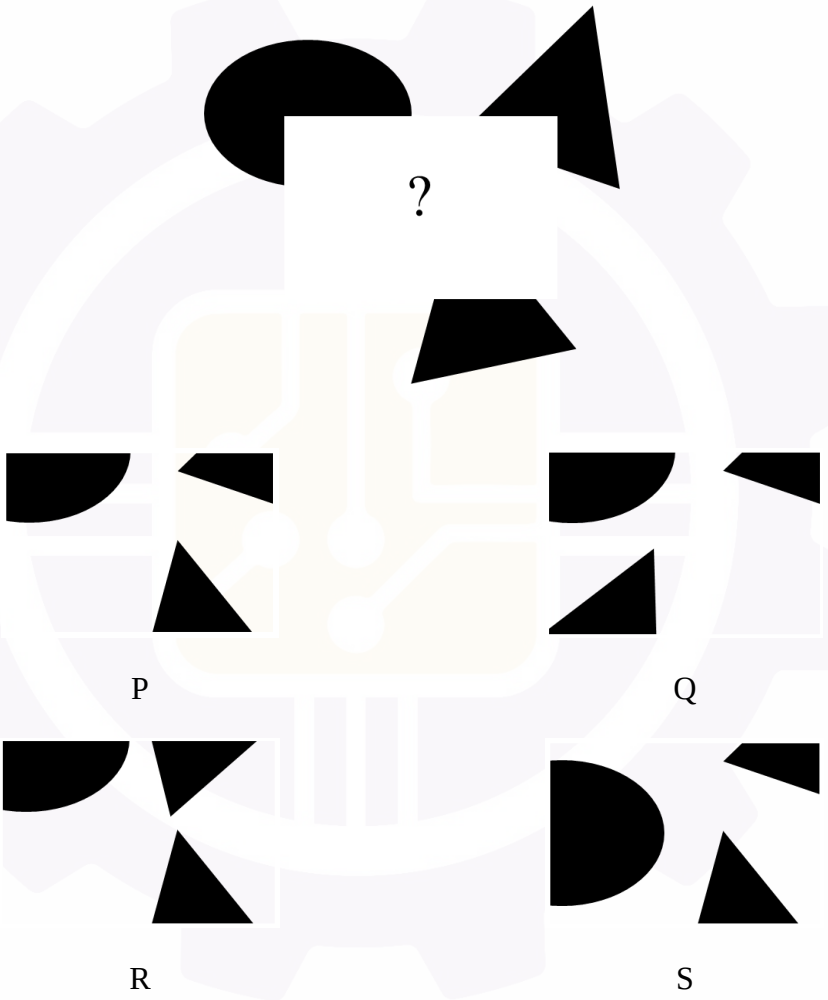
General Aptitude (GA)

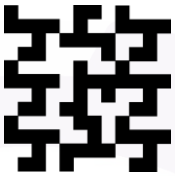
Q.1 – Q.5 Carry ONE mark Each

Q.1	‘The shopkeeper sells lemons.’ In this sentence, the word ‘lemons’ is the _____.
(A)	object
(B)	subject
(C)	predicate
(D)	verb

Q.2	The figure below is supposed to show three non-overlapping shapes – one oval and two triangles. Which one of the following figures P, Q, R, or S fits the missing portion indicated by '?' and completes the oval and the two triangles? 
(A)	P
(B)	Q
(C)	R
(D)	S

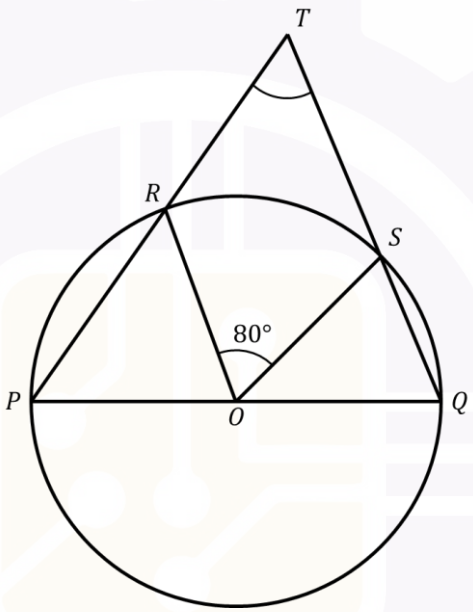
Q.3	At how many points will the curves $y = x^2$ and $y = -x^2 - 2x - 1$ intersect in the real (x, y) plane?
(A)	0
(B)	1
(C)	2
(D)	3

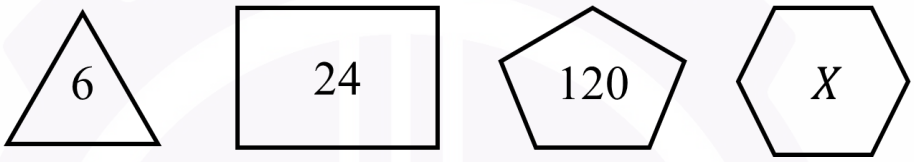
Q.4	'If Anish had scored hundred runs in today's match, he would have been made the captain of his team. He would have then become the youngest captain in his team's history. Unfortunately, he got out without scoring any runs. Hence, there won't be any change in the captaincy for now.' Based on the paragraph above, which one of the following statements is true?
(A)	Anish made hundred runs but was denied captaincy.
(B)	Anish was the captain of his team before the game today.
(C)	The current captain is older than Anish.
(D)	Anish is the youngest player in his team.

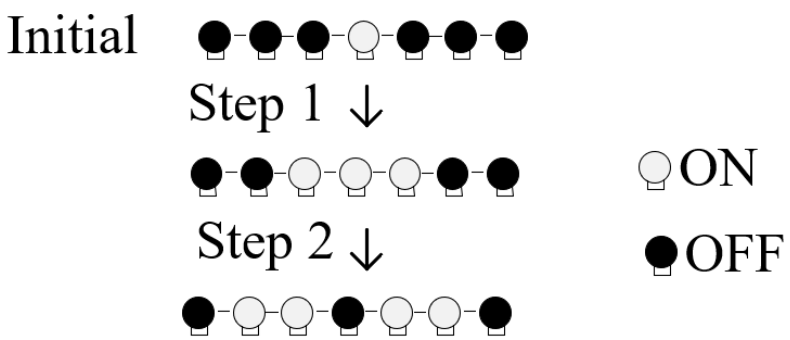
Q.5	Which one of the following figures P, Q, R, or S, correctly shows the 45° clockwise-rotated version of figure (I)?  (I)  P  Q  R  S
(A)	P
(B)	Q
(C)	R
(D)	S

Q.6 – Q.10 Carry TWO marks Each

<table>
<tr><td>Q.6</td><td>Match the words in Column I with their synonyms in Column II.
<table>
<tr><th colspan="2">Column I</th><th colspan="2">Column II</th></tr>
<tr><td>(i)</td><td>Lonely</td><td>(p)</td><td>Verbatim</td></tr>
<tr><td>(ii)</td><td>Literal</td><td>(q)</td><td>Solitary</td></tr>
<tr><td>(iii)</td><td>Lousy</td><td>(r)</td><td>Deadly</td></tr>
<tr><td>(iv)</td><td>Lethal</td><td>(s)</td><td>Terrible</td></tr>
</table></td></tr>
<tr><td></td><td></td></tr>
<tr><td>(A)</td><td>(i)-(q); (ii)-(p); (iii)-(s); (iv)-(r)</td></tr>
<tr><td>(B)</td><td>(i)-(q); (ii)-(s); (iii)-(r); (iv)-(p)</td></tr>
<tr><td>(C)</td><td>(i)-(s); (ii)-(p); (iii)-(q); (iv)-(r)</td></tr>
<tr><td>(D)</td><td>(i)-(r); (ii)-(s); (iii)-(p); (iv)-(q)</td></tr>
<tr><td></td><td></td></tr>
</table>

Q.7	In the given figure, $\overline{PQ}$ is the diameter of a circle with center O. Two points R and S are chosen on the circle such that $\angle ROS = 80°$. When $\overline{PR}$ and $\overline{QS}$ are extended, they meet at T. The value of $\angle RTS$ is _____ 
(A)	40°
(B)	50°
(C)	60°
(D)	80°

Q.8	Based on the relationship between each polygon and the number inside it, the value of '*X*' is _____ 
(A)	720
(B)	596
(C)	24
(D)	240

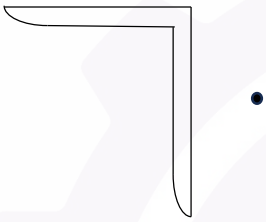
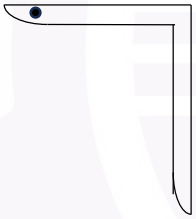
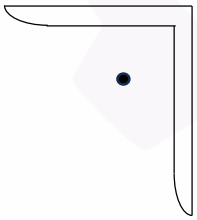
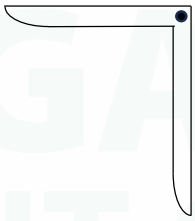
Q.9	Consider a linear arrangement of seven bulbs, each of which can be in the ON or OFF states. The initial configuration of the bulbs is shown in the figure. In every Step, the states of the bulbs are changed based on the following rules: • Any OFF bulb with exactly one ON neighbor at the end of the previous Step is turned ON. • Any ON bulb with both neighbors ON at the end of the previous Step is turned OFF. • The state of any bulb not meeting the conditions above is left unchanged. The state of bulbs at the end of Step 1 and Step 2 are also shown in the figure. The number of bulbs which are ON at the end of Step 8 is _____ 
(A)	5
(B)	4
(C)	3
(D)	0

Q.10	P and Q are two positive integers such that $P^2 = Q^2 + 13$. The product of the numbers P and Q is _____
(A)	13
(B)	26
(C)	39
(D)	42

Q.11 – Q.35 Carry ONE mark Each

Q.11	Matrix P is given as $$P = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$ The TRUE option is
(A)	Trace of P is equal to the sum of the Eigen values of P.
(B)	$P^T P$ is an identity matrix.
(C)	P is a skew-symmetric matrix.
(D)	Absolute magnitude of each Eigen value is 1.

Q.12	Given: $$\begin{bmatrix}1 & 1 & 1\\ 1 & 0 & 2\end{bmatrix}\begin{Bmatrix}x_1\\ x_2\\ x_3\end{Bmatrix}=\begin{Bmatrix}0\\ 0\end{Bmatrix}$$ The above system of equations represents a
(A)	plane
(B)	line
(C)	volume
(D)	point
Q.13	A thin-walled spherical gas balloon of radius R and wall thickness t ($t << R$) is subjected to an internal (gauge) pressure p. The maximum tensile and shear stresses in the balloon wall are, respectively:
(A)	Zero and $pR/2t$
(B)	$pR/2t$ and Zero
(C)	$pR/2t$ and $pR/4t$
(D)	$pR/4t$ and Zero

Q. 14	Black dot shown in the figure qualitatively represents the shear centre of the angle section. The option which represents the position of the shear centre is:
(A)	
(B)	
(C)	
(D)	

Q.15	Which one of the following is utilized to determine the long-term deformation of concrete under sustained loading?
(A)	Creep
(B)	Shrinkage
(C)	Modulus of rupture
(D)	Split tensile strength
Q.16	Two reservoirs having different water levels are connected by two long parallel pipelines of same length and same material but having diameters of 600 mm and 400 mm. Using Darcy-Weisbach equation, the ratio of flowrate of water in the bigger diameter pipe to that in the smaller diameter pipe is
(A)	0.54
(B)	1.22
(C)	1.84
(D)	2.76

Q.17	An irrigation canal is to be designed to deliver 10 cumec to meet the peak demand of 7500 hectare of cropped area. The estimated canal losses are 50 % of the head discharge. The duty (in hectare/cumec) on capacity of this canal is
(A)	375
(B)	1125
(C)	1500
(D)	1875

Q.18

The name of a person in Column 1 is to be matched with the test mentioned in Column 2.

Column 1	Column 2
(I) Menard	(P) Dilatometer test
(II) Marchetti	(Q) Pressuremeter test
(III) Casagrande	(R) Compaction test
(IV) Proctor	(S) Liquid limit test

Option giving the CORRECT match between Column 1 and Column 2 is:

(A) (I) – (Q) ; (II) – (P) ; (III) – (S) ; (IV) – (R)

(B) (I) – (R) ; (II) – (S) ; (III) – (Q) ; (IV) – (P)

(C) (I) – (P) ; (II) – (Q) ; (III) – (S) ; (IV) – (R)

(D) (I) – (R) ; (II) – (S) ; (III) – (P) ; (IV) – (Q)

Q.19	Corrections are applied to the basic length of the runway strip considering: (i) The elevation H (in m) of the airport above Mean Sea Level (MSL) (ii) Corrected air temperature T (in ^{o} C) with respect to the standard temperature at elevation H (iii) The effective gradient G (in %) along the length of the runway Respective correction applied to the basic length of the runway is:
(A)	$0.07 \times \frac{H}{300}$; $0.01 \times T$; $0.10 \times G$
(B)	$0.01 \times \frac{H}{300}$; $0.07 \times T$; $0.10 \times G$
(C)	$0.07 \times \frac{H}{300}$; $0.10 \times T$; $0.01 \times G$
(D)	$0.10 \times \frac{H}{300}$; $0.07 \times T$; $0.01 \times G$
Q.20	The Whole Circle Bearing (WCB) of line AB is 150^{o}. The length of AB is 100 m. The latitude and departure values, respectively, for this line are:
(A)	+86.60 ; +50.00
(B)	+86.60 ; –50.00
(C)	–86.60 ; +50.00
(D)	–86.60 ; –50.00

Q.21	A rapid sand filter bed of depth 0.8 m has 40 % porosity during service cycle. It is recommended that during backwash operation, the expanded filter bed should have 70 % porosity. The uniform expanded depth (in m) of the filter bed during backwash is
(A)	1.0
(B)	1.2
(C)	1.4
(D)	1.6
Q.22	The settling velocity of inorganic particles in the sedimentation tank of a water treatment plant is governed by
(A)	Darcy’s law
(B)	Stokes’ law
(C)	Dupuit’s law
(D)	Bernoulli’s law

<table>
<tr><td>Q.23</td><td>Gradually Varied Flow (GVF) profiles in open channels given in Column 1 are to be matched with the water surface slopes in Column 2 in the table below.
<table>
<tr><th>Column 1
GVF Profile</th><th>Column 2
Water Surface Slope</th></tr>
<tr><td>(P) M1</td><td>(I) Positive</td></tr>
<tr><td>(Q) M2</td><td>(II) Negative</td></tr>
<tr><td>(R) M3</td><td>(III) Zero</td></tr>
</table>
Which of the following options is/are NOT correct?</td></tr>
<tr><td></td><td></td></tr>
<tr><td>(A)</td><td>(P) – (I) ; (Q) – (II) ; (R) – (I)</td></tr>
<tr><td>(B)</td><td>(P) – (I) ; (Q) – (II) ; (R) – (III)</td></tr>
<tr><td>(C)</td><td>(P) – (II) ; (Q) – (I) ; (R) – (I)</td></tr>
<tr><td>(D)</td><td>(P) – (I) ; (Q) – (III) ; (R) – (II)</td></tr>
<tr><td></td><td></td></tr>
</table>

Q.24	Cant C on a Broad Gauge railway track is calculated for an equilibrium speed V (in km/h), dynamic gauge G (in mm) and radius of curve R (in m) using formula/formulae:
(A)	$C = \frac{GV^2}{127\,R}$
(B)	$C = \frac{13.76\,V^2}{R}$
(C)	$C = \frac{13.20\,V^2}{R}$
(D)	$C = \frac{8.33\,V^2}{R}$
Q.25	Which of the following components is/are NOT removed in the secondary treatment of sewage?
(A)	Suspended settleable organic solids
(B)	Colloids including dissolved organic matter
(C)	Pathogens
(D)	Fat and grease

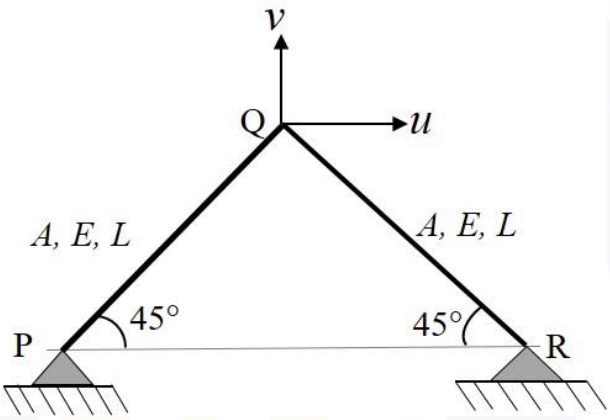
Q.26	Bag I contains 4 white and 6 black balls. Bag II contains 4 white and 3 black balls. One ball is drawn at random from any one of the two bags and it is found to be a black ball. The probability that the black ball was drawn from Bag I is _____ (*rounded off to two decimal places*).
Q.27	A matrix is given as: $\begin{bmatrix} 9 & 15 \\ 15 & 50 \end{bmatrix}$ By performing Cholesky decomposition, $\lvert l_{22} \rvert$ of the lower triangular matrix is _____ (*in integer*).
Q.28	It is given that x and y are integers in the following equation: $(x + y - 7)^2 + (y + 3x - 13)^2 = 0$ The value of $(x^3 + y^3)$ is _____ (*in integer*).
Q.29	The required centre-to-centre spacing of 10 mm diameter bars is 150 mm to resist the design moment in a concrete slab. Instead of 10 mm diameter bars, if 12 mm diameter bars of the same grade are used, the required centre-to-centre spacing (in mm) to resist the same design moment becomes _____ (*rounded off to the nearest integer*).
Q.30	Two steel plates are to be connected together by a 5 mm fillet weld of length 150 mm to transfer a design load. If the size of the fillet weld used to connect the same two plates is changed to 6 mm, the weld length (in mm) needed for transferring the same design load is _____ (*in integer*).
Q.31	For a liquid, the permeability of a sandy soil having a void ratio of 0.60 was determined as 0.14 cm/s. Considering the same liquid and by using Taylor's equation, the permeability (in cm/s) of this soil corresponding to the void ratio of 0.80 is _____ (*rounded off to two decimal places*).
Q.32	To obtain undisturbed clay soil sample, an Area Ratio of 10 % needs to be achieved for a thin walled sampling tube. If the outer diameter of the tube is 50.8 mm, the inner diameter (in mm) is _____ (*rounded off to one decimal place*).

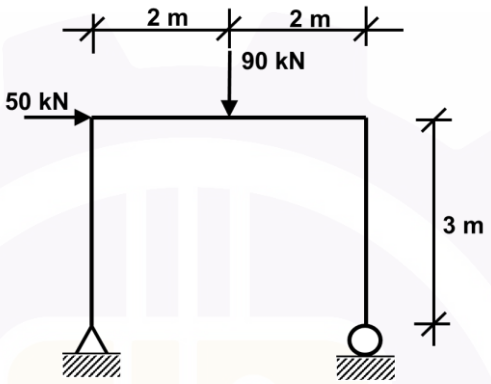
Q.33	The travel times of three vehicles on a 2 km stretch of road are 4, 5, and 8 minutes. Assuming the speed of each vehicle to be constant in this stretch, the Space Mean Speed (in km/h) of the vehicles is _____ (*rounded off to two decimal places*).
Q.34	A 30 m long tape is standardized at 25 ^{o}C. It was used to measure the length of a line which came out to be 200 m. The temperature during the measurement was 35 ^{o}C. The coefficient of expansion of the tape was 11×10^{-6} per ^{o}C. The correction in the measured length (in mm) due to change in temperature is _____ (*in integer*).
Q.35	The height of the plane of collimation of a levelling instrument is 100.000 m from a datum. The levelling instrument measures a Back Sight of 1.500 m on a vertically held staff at a ground point *P*. The reduced level (in m) of the ground point *P* with respect to the datum is _____ (*rounded off to three decimal places*).

Q.36 – Q.65 Carry TWO marks Each

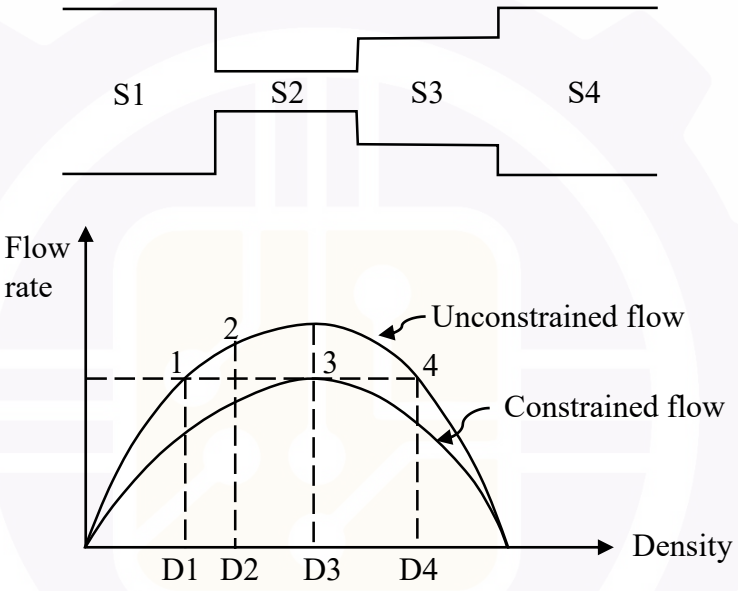
Q.36	Let $f(x)$ be a continuous function defined in $[0,2] \rightarrow \mathbb{R}$ and satisfying the equation $\int_0^2 f(x)[x - f(x)]dx = \frac{2}{3}$. The value of $f(1)$ is
(A)	1
(B)	2
(C)	$\frac{1}{2}$
(D)	0

Q.37	An ordinary differential equation is given below. $$x^2 \frac{d^2y}{dx^2} = 6y$$ Considering a and b as arbitrary constants, the general solution of the equation is
(A)	$y(x) = ax^3 + \frac{b}{x^2}$
(B)	$y(x) = ax^2 + \frac{b}{x^3}$
(C)	$y(x) = ax^2 + b \ln x$
(D)	$y(x) = ax^3 + b \ln x$

Q.38	A plane truss consists of two linearly elastic, homogeneous, identical members, namely PQ and QR. Both members have length (L), cross-sectional area (A), and modulus of elasticity (E). The members are inclined at 45° as shown in the figure. The truss has hinge supports at P and R. The translational degrees-of-freedom (u and v) are shown at joint Q.  **(Figure not to scale)** After application of the boundary conditions, the stiffness matrix of the truss becomes:
(A)	$\frac{AE}{L}\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$
(B)	$\frac{AE}{L}\begin{bmatrix}1 & 0.5\\ 0.5 & 1\end{bmatrix}$
(C)	$\frac{AE}{L}\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$
(D)	$\frac{AE}{L}\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}$

Q.39	The plane frame has a hinge and a roller support, and is loaded as shown in the figure. Both the columns have same height.  **(Figure not to scale)** What is the absolute value of the maximum bending moment (in kN-m) in the frame?
(A)	165
(B)	150
(C)	240
(D)	195

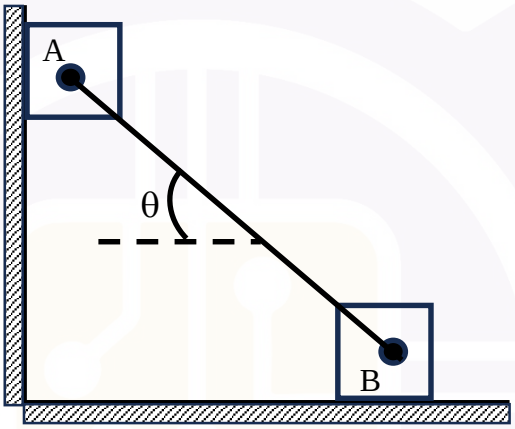
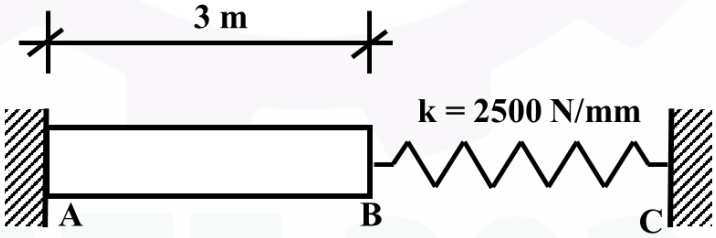
Q.40	For a hydraulic jump formed in a rectangular horizontal channel, the sequent depth ratio is 2. The Froude number of supercritical stream is
(A)	$\sqrt{3}$
(B)	$\sqrt{5}$
(C)	$\sqrt{6}$
(D)	$\sqrt{8}$
Q.41	In a laminar flow of a Newtonian fluid through a circular pipe of radius 5 cm, the maximum velocity is found to be 2 m/s. The velocity (in m/s) at a radial distance of 2.50 cm from the axis of the pipe is
(A)	1.00
(B)	1.25
(C)	1.50
(D)	1.75

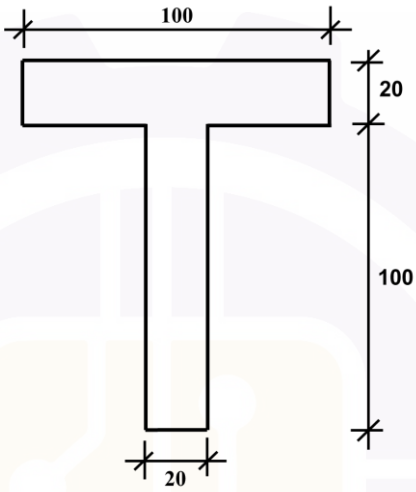
Q.42	A road is divided into four sections having varying widths as shown in the figure. Section-2 (S2) represents a capacity constrained condition with respect to the traffic flow passing through Section-1 (S1). Section-3 (S3) and Section-4 (S4) do not face any such capacity constraint with respect to the flow. A flow-density relationship for unconstrained and constrained flow conditions is shown in the figure.  If Section-1 observes density D2, the option representing the correct state of density in Sections 2, 3 and 4 is:
(A)	S2 – D4 ; S3 – D3 ; S4 – D2
(B)	S2 – D3 ; S3 – D2 ; S4 – D1
(C)	S2 – D3 ; S3 – D4 ; S4 – D2
(D)	S2 – D4 ; S3 – D3 ; S4 – D1

Q.43	Locations P and Q are separated by a wide valley. The difference in levels of locations P and Q measured by a levelling instrument stationed near P is 3.0 m. The same instrument stationed near Q measures the difference in levels of locations P and Q as -1.0 m. Assume that the atmospheric refraction is same during the measurements. The true difference in levels (in m) of locations P and Q is
(A)	1.0
(B)	1.5
(C)	2.0
(D)	4.0
Q.44	The average sewage from a city is 90 million litres per day and the average 5-day Biochemical Oxygen Demand (BOD_5) is 300 mg/l. Average standard BOD_5 of the domestic sewage is 0.08 kg/day/person. The population equivalent of the city is
(A)	337500
(B)	216000
(C)	270000
(D)	168750

Q.45	Select ALL CORRECT option(s) which can be considered to check whether the flexural stresses in a prestressed concrete beam are within the allowable stresses at the transfer and the service stages.
(A)	Limiting zone for prestressing
(B)	Magnel's graph
(C)	Hoyer effect
(D)	Load balancing method
Q.46	As per the Rankine's earth pressure theory, which of the following statements is/are FALSE?
(A)	For the active earth pressure, the inclination of failure plane is $(45° + \phi/2)$ with respect to the major principal plane.
(B)	For the active earth pressure, the inclination of failure plane is $(45° - \phi/2)$ with respect to the major principal plane.
(C)	For the passive earth pressure, the inclination of failure plane is $(45° + \phi/2)$ with respect to the major principal plane.
(D)	For the passive earth pressure, the inclination of failure plane is $(45° - \phi/2)$ with respect to the major principal plane.

Q.47	Which of the following statements is/are TRUE in the context of the geometric design of highways?
(A)	The coefficient of friction used for the design of horizontal curves is lower than the coefficient of friction used in the computation of the sight distances.
(B)	Centrifugal force at horizontal curve is counteracted by raising the middle of the pavement with respect to the edges.
(C)	Grade compensation is achieved by increasing the gradient of the horizontal curve.
(D)	Under identical conditions, the design length of the summit curve of a road having unidirectional flow will be greater than that of the same road having bidirectional flow.
Q.48	Starting with the first approximation as x = 0.5, the second approximation for the root of the following function by the Newton-Raphson method is _____ (*rounded off to two decimal places*). $$f(x) = e^{-x} - x$$
Q.49	Values of y for different values of x are tabulated below. <table><tr><td>x</td><td>-2</td><td>1</td><td>2</td></tr><tr><td>y</td><td>28</td><td>4</td><td>16</td></tr></table> If a second-degree interpolating polynomial $P_2(x)$ is used to represent y, the value of $P_2(0)$ is _____ (*rounded off to the nearest integer*).

Q.50	Two identical blocks A and B are connected by a rigid rod. The blocks rest against vertical and horizontal planes, as shown in the figure. The coefficient of static friction at the vertical and horizontal planes is the same. If the sliding impends when $\theta = 45^{o}$, the value of the coefficient of static friction is _____ (*rounded off to two decimal places*). 
Q.51	A homogenous, linearly elastic rod AB is connected to a linearly elastic spring BC in between the fixed supports at A and C, as shown in the figure. The cross-sectional area, modulus of elasticity, and the coefficient of thermal expansion of the rod AB are 500 mm^2, 60×10^3 MPa, and 12×10^{-6} per ^{o}C, respectively. The stiffness (k) of spring BC is 2500 N/mm.  **(Figure not to scale)** The internal force (in kN) that will develop in the spring BC when the temperature of rod AB is increased by 100 ^{o}C is _____ (*rounded off to one decimal place*).

Q.52	The cross-section of a steel T-beam is shown in the figure where all dimensions are in mm.  **(Figure not to scale)** The plastic section modulus of the given cross-section is _____ × 10^4 mm^3 (*in integer*).
Q.53	A fully-penetrating well of 20 cm diameter is provided in an unconfined aquifer. The height of the ground water table is 30 m from the bottom of the aquifer. After a long period of pumping at a rate of 63 m^3/s, the drawdown in the observation wells at 10 m and 100 m from the pumped well is 12 m and 11 m, respectively. The transmissibility (in m^2/s) of the aquifer is _____ (*rounded off to one decimal place*).
Q.54	A wide unlined channel carries sediment-free water. The depth of water is 1 m. The specific weight of water is 10 kN/m^3. To prevent scouring, the maximum permissible tractive stress on bed is 10 N/m^2. The maximum slope of the channel bed to prevent scouring is 1 in *n*. The value of *n* is _____ (*in integer*).
Q.55	A bridge with an expected life of 50 years is designed for a flood of 10000 m^3/s corresponding to the return period of 100 years. The risk associated with this design is _____ (*rounded off to two decimal places*).

Q.56	An infinite slope with slope angle β = 22° consists of soil with the following properties: Unit weight γ = 15.72 kN/m^3 Cohesion c' = 12 kPa Angle of internal friction ϕ' = 15° The critical height of the slope (in m) is _____ (*rounded off to two decimal places*).
Q.57	A circular pile of 600 mm diameter and 6 m length is embedded in a saturated clayey soil. Undrained cohesion of the soil is 80 kPa. Unit weight of the soil is 19.20 kN/m^3. The adhesion factor is 0.54. If the diameter of the pile is doubled to 1200 mm (keeping the length constant), the ratio of pile capacity of 1200 mm diameter pile to that of 600 mm diameter pile is _____ (*rounded off to two decimal places*).
Q.58	A group of 25 circular piles is arranged in 5 × 5 uniform pattern in a soft clay soil with equal spacing in both the directions. These are friction piles with negligible end bearing. Consider the following details: Diameter of each pile = 1 m Length of each pile = 15 m Cohesion of the soil = 20 kN/m^2 Unit weight of the soil = 16 kN/m^3 Adhesion factor = 0.75 Considering the efficiency of the pile group as unity, the optimum value of the ratio of the pile spacing to pile diameter is _____ (*rounded off to one decimal place*).
Q.59	A shallow strip footing of width 2 m is embedded at a depth of 1.5 m below the ground surface in a homogeneous pure clay with an angle of internal friction zero. Consider unit weight of soil as 20 kN/m^3 and undrained cohesion of soil as 20 kN/m^2. Due to rise of ground water table from far below the founding depth to the ground surface in monsoon season, the magnitude of percentage change in the net ultimate bearing capacity as per Terzaghi's theory is _____ (*rounded off to two decimal places*).

Q.60	Traffic is moving on a 6-lane dual carriageway road. Traffic volume per direction during peak hour (08:00 am to 09:00 am) is 6000 veh/h. It is assumed that the traffic is distributed uniformly across the lanes in each direction. Just at 08:00 am, a truck goes out of order on the middle lane of one side, thus disrupting the traffic on that lane in one direction. The lane capacity under normal conditions is 2000 veh/h/ln and under queue formation it is 1600 veh/h/ln. The traffic resumes at 08:30 am on removing the truck from the middle lane. Hourly traffic volume after 09:00 am reduces to 5000 veh/h/dir. The number of vehicles in the queue at 10:00 am is _____ (*in integer*).
Q.61	In a bituminous mix, the percentage by weight of coarse aggregate, fine aggregate, filler, and bituminous binder is 58, 25, 12, and 5, respectively. The corresponding specific gravity of these materials is 2.68, 2.45, 2.42, and 1.15. The bulk specific gravity of the mix is 2.2. The Voids Filled with Bitumen (VFB, in percentage) is _____ (*rounded off to the nearest integer*).
Q.62	The following consecutive readings (in m) were taken with a dumpy level and a levelling staff at a common interval of 20 m: 0.385; 1.030; 1.925; 2.825; 3.730; 4.850; 1.045; 2.005; 3.330; 4.580 The dumpy level was shifted after taking the sixth reading. The gradient (in %) of the ground between the first and the last location of the reading is _____ (*in integer*).
Q.63	An Activated Sludge Process (ASP) has an inlet wastewater flowrate of 20000 m^3/day with a Biochemical Oxygen Demand (BOD) concentration of 250 mg/l. It produces treated wastewater containing 20 mg/l BOD. The aeration tank has a working volume of 6000 m^3 and a biomass concentration of 3000 mg/l. Biological Sludge Residence Time (BSRT) of the system is 6 days. The influent wastewater and the treated effluent from the system have negligible concentrations of biomass. The sludge recycle line from the bottom of the Secondary Sedimentation Tank (SST) to the inlet of the aeration tank has a flowrate of 6000 m^3/day. To maintain equilibrium, the flowrate (in m^3/day) of sludge that is to be wasted from the system is _____ (*in integer*).

Q.64	The intensity-duration relationship for a rainfall on a rectangular plot ABCD of area 7 ha (1 ha = 10^4 m^2) can be modelled by the following equation: $$I = \frac{25}{(t + 10)}$$ where I is rainfall intensity (in cm/h), and t is the duration (in minutes) of rainfall. The average runoff coefficient over the area is 0.60. The time of entry (in minutes) to the outfall from the corners A, B, C, and D is 10, 20, 15 and 25, respectively. The design flowrate (in m^3/h) of the storm-sewer at the outfall is _____ (*in integer*).
Q.65	The maximum demand at a water purification plant has been estimated as 12 million litres per day. For the raw supplies, a rectangular sedimentation tank is to be designed with mechanical sludge removal arrangement. Consider depth of the tank as 4 m, detention period as 6 hours, and velocity of flow as 0.003 m/s. The width (in m) of the detention tank is _____ (*rounded off to two decimal places*).