Q. 1 – Q. 5 carry one mark each.

Q.1 Daytime temperatures in Delhi can _____ 40°C.

(A) get (B) stand (C) reach (D) peak

Q.2 The growth rate of ABC Motors in 2017 was the same _____ XYZ Motors in 2016.

(A) as off (B) as those of (C) as that off (D) as that of

Q.3 Suresh wanted to lay a new carpet in his new mansion with an area of 70 × 55 sq. mts. However an area of 550 sq. mts. had to be left out for flower pots. If the cost of carpet is Rs. 50 per sq. mts., how much money (in Rs.) will be spent by Suresh for the carpet now?

(A) Rs. 1,65,000 (B) Rs. 1,92,500 (C) Rs. 2,75,000 (D) Rs. 1,27,500

Q.4 A retaining wall with measurements 30m × 12m × 6m was constructed with bricks of dimensions 8cm × 6cm × 6cm. If 60% of the wall consists of bricks, the number of bricks used for the construction is _____ lakhs.

(A) 30 (B) 40 (C) 45 (D) 75

Q.5 Hima Das was _____ only Indian athlete to win _____ gold for India.

(A) the, many (B) the, a (C) an, a (D) an, the

Q. 6 – Q. 10 carry two marks each.

Q.6 Mohan, the manager, wants his four workers to work in pairs. No pair should work for more than 5 hours. Ram and John have worked together for 5 hours. Krishna and Amir have worked as a team for 2 hours. Krishna does not want to work with Ram. Whom should Mohan allot to work with John, if he wants all the workers to continue working?

(A) Amir (B) Krishna (C) Ram (D) None of the three

Q.7 Population of state X increased by *x*% and the population of state Y increased by *y*% from 2001 to 2011. Assume that *x* is greater than *y*. Let P be the ratio of the population of state X to state Y in a given year. The percentage increase in P from 2001 to 2011 is _____.

(A) $\frac{x}{y}$ *(B)* $x - y$ (C) $\frac{100(x-y)}{100+x}$ (D) $\frac{100(x-y)}{100+y}$

Q.8 *The Newspaper* reports that over 500 hectares of tribal land spread across 28 tribal settlements in Mohinitampuram forest division have already been "alienated". A top forest official said, "First the tribals are duped out of their land holdings. Second, the families thus rendered landless are often forced to encroach further into the forests".

On the basis of the information available in the paragraph, _____ is/are responsible for duping the tribals.

(A) forest officials
(B) landless families
(C) The Newspaper
(D) it cannot be inferred who

Q.9 An oil tank can be filled by pipe X in 5 hours and pipe Y in 4 hours, each pump working on its own. When the oil tank is full and the drainage hole is open, the oil is drained in 20 hours. If initially the tank was empty and someone started the two pumps together but left the drainage hole open, how many hours will it take for the tank to be filled? (Assume that the rate of drainage is independent of the Head)

(A) 1.50 (B) 2.00 (C) 2.50 (D) 4.00

Q.10 "Popular Hindi fiction, despite – or perhaps because of – its wide reach, often does not appear in our cinema. As ideals that viewers are meant to look up to rather than identify with, Hindi film protagonists usually read books of aspirational value: textbooks, English books, or high value literature."
Which one of the following CANNOT be inferred from the paragraph above?

(A) Though popular Hindi fiction has wide reach, it often does not appear in the movies

(B) Protagonists in Hindi movies, being ideals for viewers, read only books of aspirational value

(C) Textbooks, English books or high literature have aspirational value, Hindi fiction

(D) People do not look up to writers of textbooks, English books or high v

END OF THE QUESTION PAPER

Q. 1 – Q. 25 carry one mark each.

Q.1 Euclidean norm (length) of the vector $[4 \quad -2 \quad -6]^T$ is

(A) $\sqrt{12}$ (B) $\sqrt{24}$ (C) $\sqrt{48}$ (D) $\sqrt{56}$

Q.2 The Laplace transform of $\sinh(at)$ is

(A) $\frac{a}{s^2-a^2}$ (B) $\frac{a}{s^2+a^2}$ (C) $\frac{s}{s^2-a^2}$ (D) $\frac{s}{s^2+a^2}$

Q.3 The following inequality is true for all x close to 0.

$$2-\frac{x^2}{3}<\frac{x\sin x}{1-\cos x}<2$$

What is the value of $\lim_{x\to 0}\frac{x\sin x}{1-\cos x}$?

(A) 0 (B) 1/2 (C) 1 (D) 2

Q.4 What is curl of the vector field $2x^2y\mathbf{i}+5z^2\mathbf{j}-4yz\mathbf{k}$?

(A) $6z\mathbf{i}+4x\mathbf{j}-2x^2\mathbf{k}$

(B) $6z\mathbf{i}-8xy\mathbf{j}+2x^2y\mathbf{k}$

(C) $-14z\mathbf{i}+6y\mathbf{j}+2x^2\mathbf{k}$

(D) $-14z\mathbf{i}-2x^2\mathbf{k}$

Q.5 A closed thin-walled tube has thickness, t, mean enclosed area within the boundary of the centerline of tube's thickness, A_m, and shear stress, τ. Torsional moment of resistance, T, of the section would be

(A) $0.5\tau A_m t$ (B) $\tau A_m t$ (C) $2\tau A_m t$ (D) $4\tau A_m t$

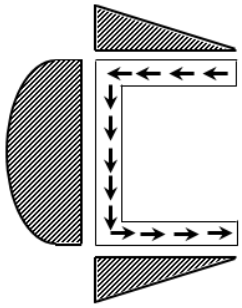
Q.6 A steel column is restrained against both translation and rotation at one end and is restrained only against rotation but free to translate at the other end. Theoretical and design (IS:800- 2007) values, respectively, of effective length factor of the column are

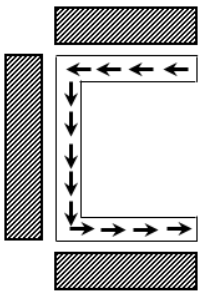
(A) 1.0 and 1.0 (B) 1.2 and 1.0 (C) 1.2 and 1.2 (D) 1.0 and 1.2

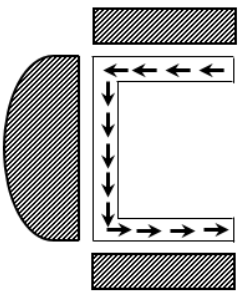
Q.7 If the fineness modulus of a sample of fine aggregates is 4.3, the mean size of the particles in the sample is between

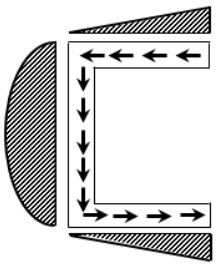
(A) 150 μm and 300 μm
(B) 300 μm and 600 μm
(C) 1.18 *mm* and 2.36 *mm*
(D) 2.36 *mm* and 4.75 *mm*

Q.8 For a channel section subjected to a downward vertical shear force at its centroid, which one of the following represents the correct distribution of shear stress in flange and web?

(A) 

(B) 

(C) 

(D) 

Q.9 Which one of the following options contains ONLY primary air pollutants?

(A) Hydrocarbons and nitrogen oxides
(B) Hydrocarbons and ozone
(C) Ozone and peroxyacetyl nitrate
(D) Nitrogen oxides and peroxyacetyl nitrate

Q.10 Analysis of a water sample revealed that the sample contains the following species.

CO_3^{2-}, Na^+, H^+, PO_4^{3-}, Al^{3+}, H_2CO_3, Cl^-, Ca^{2+}, Mg^{2+}, HCO_3^-, Fe^{2+}, OH^-

Concentrations of which of the species will be required to compute alkalinity?

(A) CO_3^{2-}, H^+, HCO_3^-, OH^-
(B) CO_3^{2-}, H^+, H_2CO_3, HCO_3^-
(C) CO_3^{2-}, H_2CO_3, HCO_3^-, OH^-
(D) H^+, H_2CO_3, HCO_3^-, OH^-

Q.11 Structural failures considered in the mechanistic method of bituminous pavement design are

(A) Fatigue and Rutting
(B) Fatigue and Shear
(C) Rutting and Shear
(D) Shear and Slippage

Q.12 A solid sphere of radius, r, and made of material with density, ρ_s, is moving through the atmosphere (constant pressure, p) with a velocity, v. The net force ONLY due to atmospheric pressure (F_p) acting on the sphere at any time, t, is

(A) $\pi r^2 p$ (B) $4\pi r^2 p$ (C) $\frac{4}{3}\pi r^3 \rho_s \frac{dv}{dt}$ (D) zero

Q.13 The velocity field in a flow system is given by $v = 2\mathbf{i} + (x + y)\mathbf{j} + (xyz)\mathbf{k}$. The acceleration of the fluid at $(1, 1, 2)$ is

(A) $2\mathbf{i} + 10\mathbf{k}$
(B) $4\mathbf{i} + 12\mathbf{k}$
(C) $\mathbf{j} + \mathbf{k}$
(D) $4\mathbf{j} + 10\mathbf{k}$

Q.14 An inflow hydrograph is routed through a reservoir to produce an outflow hydrograph. The peak flow of the inflow hydrograph is P_I and the time of occurrence of the peak is t_I. The peak flow of the outflow hydrograph is P_O and the time of occurrence of the peak is t_O. Which one of the following statements is correct?

(A) $P_I < P_O$ and $t_I < t_O$
(B) $P_I < P_O$ and $t_I > t_O$
(C) $P_I > P_O$ and $t_I < t_O$
(D) $P_I > P_O$ and $t_I > t_O$

Q.15 An earthen dam of height H is made of cohesive soil whose cohesion and unit weight are c and γ, respectively. If the factor of safety against cohesion is F_c, the Taylor's stability number (S_n) is

(A) $\frac{\gamma H}{cF_c}$ (B) $\frac{cF_c}{\gamma H}$ (C) $\frac{c}{F_c\gamma H}$ (D) $\frac{F_c\gamma H}{c}$

Q.16 The notation "SC" as per *Indian Standard Soil Classification System* refers to

(A) Sandy clay
(B) Silty clay
(C) Clayey silt
(D) Clayey sand

Q.17 An anisotropic soil deposit has coefficient of permeability in vertical and horizontal directions as k_z and k_x, respectively. For constructing a flow net, the horizontal dimension of the problem's geometry is transformed by a multiplying factor of

(A) $\sqrt{\frac{k_z}{k_x}}$ (B) $\sqrt{\frac{k_x}{k_z}}$ (C) $\frac{k_x}{k_z}$ (D) $\frac{k_z}{k_x}$

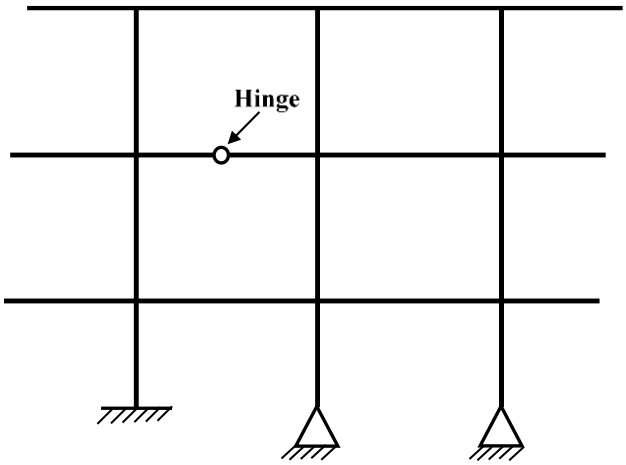
Q.18 The value of the function $f(x)$ is given at n distinct values of x and its value is to be interpolated at the point x^*, using all the n points. The estimate is obtained first by the Lagrange polynomial, denoted by I_L, and then by the Newton polynomial, denoted by I_N. Which one of the following statements is correct?

(A) I_L is always greater than I_N
(B) I_L and I_N are always equal
(C) I_L is always less than I_N
(D) No definite relation exists between I_L and I_N

Q.19 The speed-density relationship in a mid-block section of a highway follows the Greenshield's model. If the free flow speed is v_f and the jam density is k_j, the maximum flow observed on this section is

(A) $v_f k_j$ (B) $\frac{v_f k_j}{2}$ (C) $\frac{v_f k_j}{4}$ (D) $\frac{v_f k_j}{8}$

Q.20 The degree of static indeterminacy of the plane frame as shown in the figure is _____



Q.21 The characteristic compressive strength of concrete required in a project is 25 *MPa* and the standard deviation in the observed compressive strength expected at site is 4 *MPa*. The average compressive strength of cubes tested at different water-cement (*w/c*) ratios using the same material as is used for the project is given in the table.

w/c (%)	45	50	55	60
Average compressive strength of cubes (*MPa*)	35	25	20	15

The water-cement ratio (in *percent, round off to the* ***lower integer***) to be used in the mix is _____

Q.22 The data from a closed traverse survey PQRS (run in the clockwise direction) are given in the table

Line	Included angle (in *degrees*)
PQ	88
QR	92
RS	94
SP	89

The closing error for the traverse PQRS (in *degrees*) is _____

Q.23 A vehicle is moving on a road of grade +4% at a speed of 20 *m/s*. Consider the coefficient of rolling friction as 0.46 and acceleration due to gravity as 10 m/s^2. On applying brakes to reach a speed of 10 *m/s*, the required braking distance (in *m, round off to nearest integer*) along the horizontal, is _____

Q.24 The command area of a canal grows only one crop, i.e., wheat. The base period of wheat is 120 days and its total water requirement, Δ, is 40 *cm*. If the canal discharge is 2 m^3/s, the area, in *hectares*, rounded off to the nearest integer, which could be irrigated (*neglecting all losses*) is _____

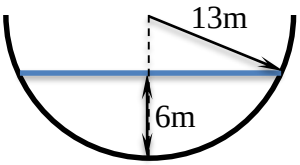
Q.25 Construction of a new building founded on a clayey soil was completed in January 2010. In January 2014, the average consolidation settlement of the foundation in clay was recorded as 10 *mm*. The ultimate consolidation settlement was estimated in design as 40 *mm*. Considering double drainage to occur at the clayey soil site, the expected consolidation settlement in January 2019 (in *mm, round off to the nearest integer*) will be _____

Q. 26 – Q. 55 carry two marks each.

Q.26 The probability density function of a continuous random variable distributed uniformly between x and y (for $y > x$) is

(A) $\frac{1}{x-y}$ (B) $\frac{1}{y-x}$ (C) $x-y$ (D) $y-x$

Q.27 Consider the hemi-spherical tank of radius 13 *m* as shown in the figure (*not drawn to scale*). What is the volume of water (in m^3) when the depth of water at the centre of the tank is 6 *m*?



(A) 78π (B) 156π (C) 396π (D) 468π

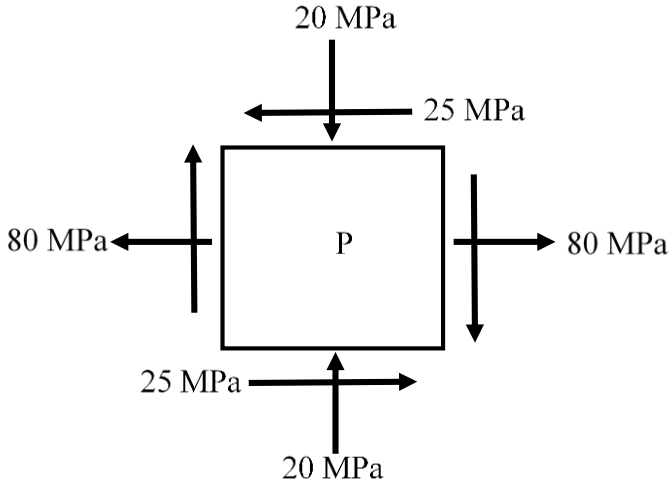
Q.28 An ordinary differential equation is given below.

$$\left(\frac{dy}{dx}\right)(x \ln x) = y$$

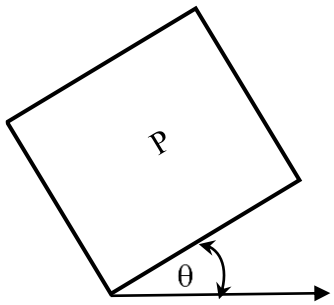
The solution for the above equation is
(*Note: K denotes a constant in the options*)

(A) $y = Kx \ln x$
(B) $y = Kxe^{x}$
(C) $y = Kxe^{-x}$
(D) $y = K \ln x$

Q.29 For a plane stress problem, the state of stress at a point P is represented by the stress element as shown in figure.



By how much angle (θ) in *degrees* the stress element should be rotated in order to get the planes of maximum shear stress?



(A) 13.3
(B) 26.6
(C) 31.7
(D) 48.3

Q.30 The critical bending compressive stress in the extreme fibre of a structural steel section is 1000 *MPa*. It is given that the yield strength of the steel is 250 *MPa*, width of flange is 250 *mm* and thickness of flange is 15 *mm*. As per the provisions of IS:800-2007, the non-dimensional slenderness ratio of the steel cross-section is

(A) 0.25 (B) 0.50 (C) 0.75 (D) 2.00

Q.31 In the context of provisions relating to durability of concrete, consider the following assertions:

Assertion (1): As per IS 456-2000, air entrainment to the extent of 3% to 6% is required for concrete exposed to marine environment.

Assertion (2): The equivalent alkali content (in terms of Na_2O equivalent) for a cement containing 1% and 0.6% of Na_2O and K_2O, respectively, is approximately 1.4% (rounded to 1 decimal place).

Which one of the following statements is CORRECT?

(A) Assertion (1) is FALSE and Assertion (2) is TRUE

(B) Assertion (1) is TRUE and Assertion (2) is FALSE

(C) Both Assertion (1) and Assertion (2) are FALSE

(D) Both Assertion (1) and Assertion (2) are TRUE

Q.32 Chlorine is used as the disinfectant in a municipal water treatment plant. It achieves 50 *percent* of disinfection efficiency measured in terms of killing the indicator microorganisms (*E-Coli*) in 3 *minutes*. The minimum time required to achieve 99 *percent* disinfection efficiency would be

(A) 9.93 *minutes*

(B) 11.93 *minutes*

(C) 19.93 *minutes*

(D) 21.93 *minutes*

Q.33 A camera with a focal length of 20 *cm* fitted in an aircraft is used for taking vertical aerial photographs of a terrain. The average elevation of the terrain is 1200 *m* above mean sea level (MSL). What is the height above MSL at which an aircraft must fly in order to get the aerial photographs at a scale of 1:8000?

(A) 2600 *m*

(B) 2800 *m*

(C) 3000 *m*

(D) 3200 *m*

Q.34 A flexible pavement has the following class of loads during a particular hour of the day.

i. 80 buses with 2-axles (each axle load of 40 *kN*);

ii. 160 trucks with 2-axles (front and rear axle loads of 40 *kN* and 80 *kN*, respectively)

The equivalent standard axle load repetitions for this vehicle combinati 2012 would be

(A) 180 (B) 240 (C) 250 (D) 320

Q.35 The inverse of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$ is

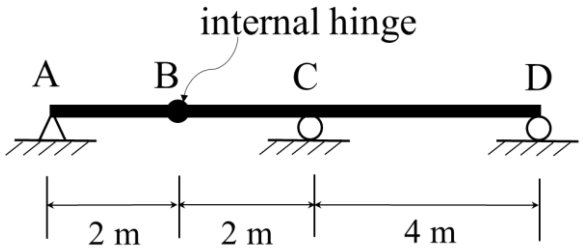
(A) $\begin{bmatrix} 10 & -4 & -9 \\ -15 & 4 & 14 \\ 5 & -1 & -6 \end{bmatrix}$

(B) $\begin{bmatrix} -10 & 4 & 9 \\ 15 & -4 & -14 \\ -5 & 1 & 6 \end{bmatrix}$

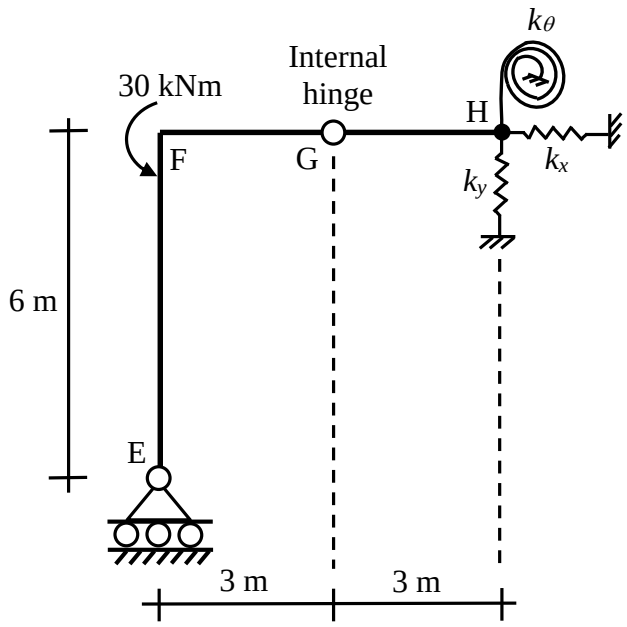
(C) $\begin{bmatrix} -2 & \frac{4}{5} & \frac{9}{5} \\ 3 & -\frac{4}{5} & -\frac{14}{5} \\ -1 & \frac{1}{5} & \frac{6}{5} \end{bmatrix}$

(D) $\begin{bmatrix} 2 & -\frac{4}{5} & -\frac{9}{5} \\ -3 & \frac{4}{5} & \frac{14}{5} \\ 1 & -\frac{1}{5} & -\frac{6}{5} \end{bmatrix}$

Q.36 A long uniformly distributed load of 10 *kN/m* and a concentrated load of 60 *kN* are moving together on the beam ABCD shown in the figure (*not drawn to scale*). The relative positions of the two loads are not fixed. The maximum shear force (in *kN, round off to the nearest integer*) caused at the internal hinge B due to the two loads is _____

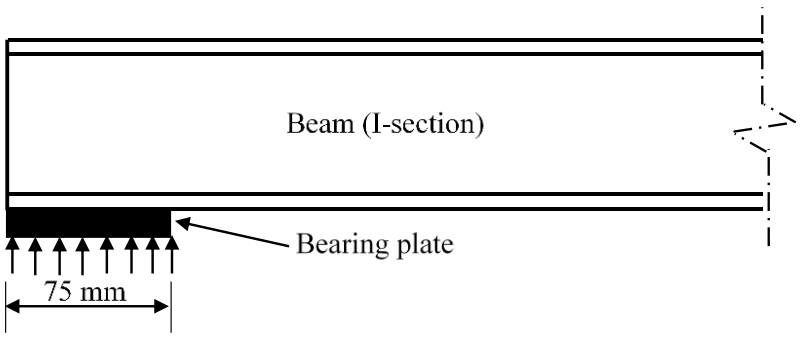


Q.37 A plane frame shown in the figure (*not to scale*) has linear elastic springs at node H. The spring constants are $k_x = k_y = 5 \times 10^5$ *kN/m* and $k_\theta = 3 \times 10^5$ *kNm/rad*.



For the externally applied moment of 30 *kNm* at node F, the rotation (in ***degrees***, *round off to 3 decimals*) observed in the rotational spring at node H is _____

Q.38 A rolled *I*-section beam is supported on a 75 *mm* wide bearing plate as shown in the figure. Thicknesses of flange and web of the *I*-section are 20 *mm* and 8 *mm*, respectively. Root radius of the *I*-section is 10 *mm*. Assume: material yield stress, $f_y = 250\ MPa$ and partial safety factor for material, $\gamma_{mo} = 1.10$.



As per IS: 800-2007, the web bearing strength (in *kN*, *round off to 2 decimal places*) of the beam is _____

Q.39 When a specimen of M25 concrete is loaded to a stress level of 12.5 *MPa*, a strain of 500×10^{-6} is recorded. If this load is allowed to stand for a long time, the strain increases to 1000×10^{-6}. In accordance with the provisions of IS:456-2000, considering the long-term effects, the effective modulus of elasticity of the concrete (in *MPa*) is _____

Q.40 A water treatment plant treats 6000 m^3 of water per day. As a part of the treatment process, discrete particles are required to be settled in a clarifier. A column test indicates that an overflow rate of 1.5 *m* per hour would produce the desired removal of particles through settling in the clarifier having a depth of 3.0 *m*. The volume of the required clarifier, (in m^3, *round off to 1 decimal place*) would be _____

Q.41 Raw municipal solid waste (MSW) collected from a city contains 70% decomposable material that can be converted to methane. The water content of the decomposable material is 35%. An elemental analysis of the decomposable material yields the following mass percent.

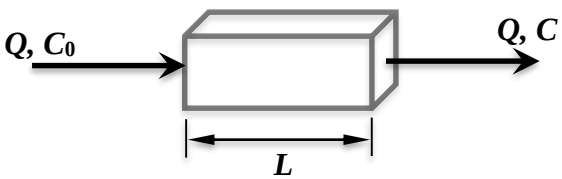
C : H : O : N : other = 44 : 6 : 43 : 0.8 : 6.2

The methane production of the decomposable material is governed by the following stoichiometric relation

$$C_aH_bO_cN_d + nH_2O \rightarrow mCH_4 + sCO_2 + dNH_3$$

Given atomic weights: C = 12, H = 1, O = 16, N = 14. The mass of methane produced (in *grams, round off to 1 decimal place*) per *kg* of raw MSW will be _____

Q.42 Consider the reactor shown in the figure. The flow rate through the reactor is Q m^3/h. The concentrations (in *mg/L*) of a compound in the influent and effluent are C_0 and C, respectively. The compound is degraded in the reactor following the first order reaction. The mixing condition of the reactor can be varied such that the reactor becomes either a completely mixed flow reactor (CMFR) or a plug-flow reactor (PFR). The length of the reactor can be adjusted in these two mixing conditions to L_{CMFR} and L_{PFR} while keeping the cross-section of the reactor constant. Assuming steady state and for $C/C_0 = 0.8$, the value of L_{CMFR}/L_{PFR} (*round off to 2 decimal places*) is _____



Q.43 A series of perpendicular offsets taken from a curved boundary wall to a straight survey line at an interval of 6 *m* are 1.22, 1.67, 2.04, 2.34, 2.14, 1.87, and 1.15 *m*. The area (in m^2, *round off to 2 decimal places*) bounded by the survey line, curved boundary wall, the first and the last offsets, determined using Simpson's rule, is _____

Q.44 The uniform arrival and uniform service rates observed on an approach road to a signalized intersection are 20 and 50 vehicles/minute, respectively. For this signal, the red time is 30 *s*, the effective green time is 30 *s*, and the cycle length is 60 *s*. Assuming that initially there are no vehicles in the queue, the average delay per vehicle using the approach road during a cycle length (in *s, round off to 2 decimal places*) is _____

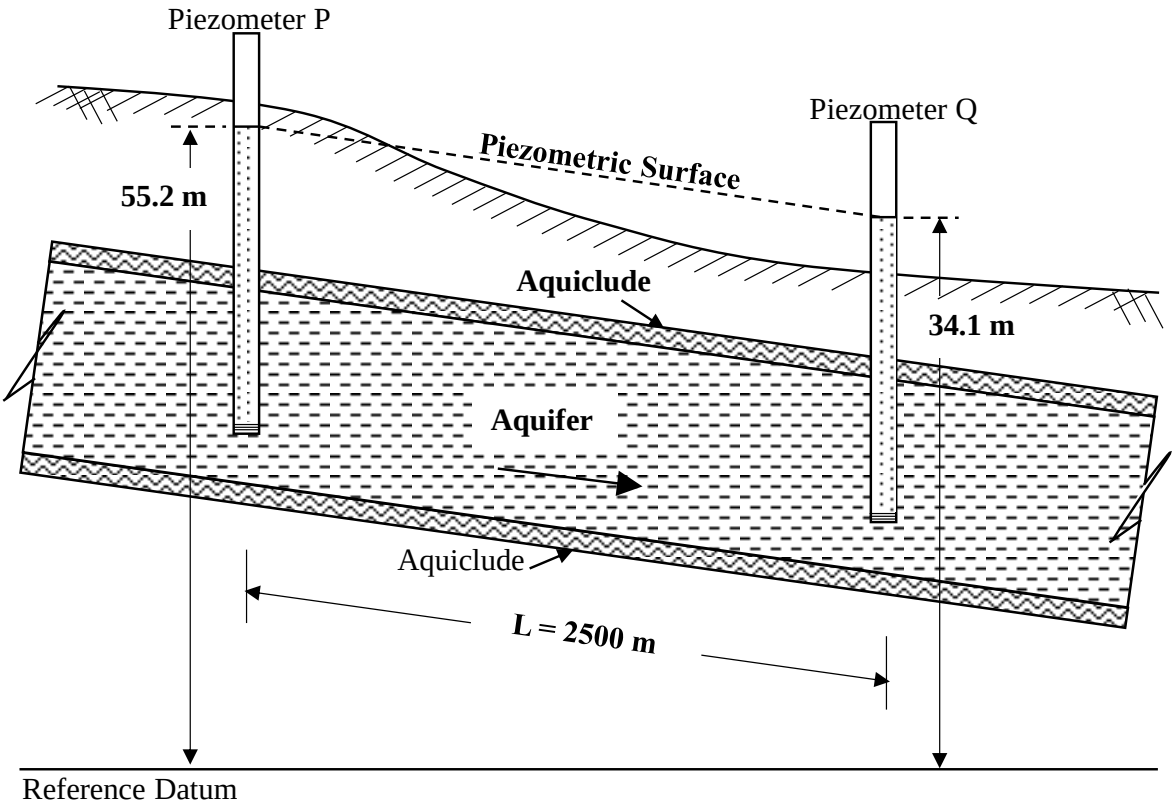
Q.45 A broad gauge railway line passes through a horizontal curved section (radius = 875 *m*) of length 200 *m*. The allowable speed on this portion is 100 *km/h*. For calculating the cant, consider the gauge as centre-to-centre distance between the rail heads, equal to 1750 *mm*. The maximum permissible cant (in *mm, round off to 1 decimal place*) with respect to the centre-to-centre distance between the rail heads is _____

Q.46 The speed-density relationship of a highway is given as

$$u = 100 - 0.5\,k$$

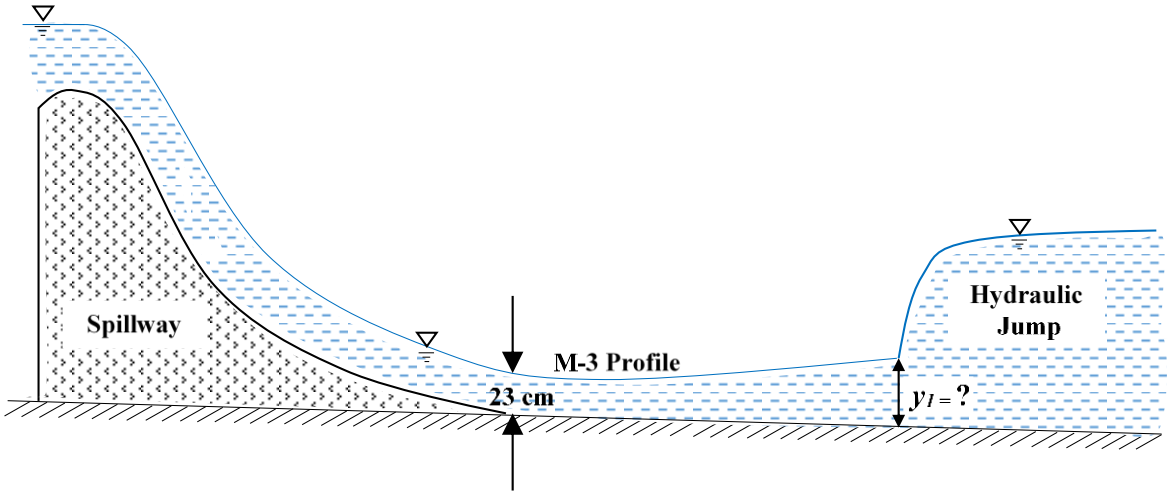
where, u = speed in *km* per hour, k = density in vehicles per *km*. The maximum flow (in vehicles per hour, *round off to the nearest integer*) is _____

Q.47 A confined aquifer of 15 *m* constant thickness is sandwiched between two aquicludes as shown in the figure (not drawn to scale).



The heads indicated by two piezometers P and Q are 55.2 *m* and 34.1 *m*, respectively. The aquifer has a hydraulic conductivity of 80 *m/day* and its effective porosity is 0.25. If the distance between the piezometers is 2500 *m*, the time taken by the water to travel through the aquifer from piezometer location P to Q (in *days, round off to 1 decimal place*) is _____

Q.48 At the foot of a spillway, water flows at a depth of 23 *cm* with a velocity of 8.1 *m/s*, as shown in the figure.



The flow enters as an M-3 profile in the long wide rectangular channel with bed slope = $\frac{1}{1800}$ and Manning's n = 0.015. A hydraulic jump is formed at a certain distance from the foot of the spillway. Assume the acceleration due to gravity, g = 9.81 m/s^2. Just before the hydraulic jump, the depth of flow y_1 (in *m*, *round off to 2 decimal places*) is _____

Q.49 Two identical pipes (i.e., having the same length, same diameter, and same roughness) are used to withdraw water from a reservoir. In the first case, they are attached in series and discharge freely into the atmosphere. In the second case, they are attached in parallel and also discharge freely into the atmosphere. Neglecting all minor losses, and assuming that the friction factor is same in both the cases, the ratio of the discharge in the parallel arrangement to that in the series arrangement (*round off to 2 decimal places*) is _____

Q.50 The ordinates, *u*, of a 2-hour unit hydrograph (*i.e., for 1 cm of effective rain*), for a catchment are shown in the table.

t (*hour*)	0	1	2	3	4	5	6	7	8	9	10	11	12
u (m^3/s)	0	2	8	18	32	45	30	19	12	7	3	1	0

A 6-hour storm occurs over the catchment such that the effective rainfall intensity is 1 *cm/hour* for the first two hours, zero for the next two hours, and 0.5 *cm/hour* for the last two hours. If the base flow is constant at 5 m^3/s, the peak flow due to this storm (in m^3/s, *round off to 1 decimal place*) will be _____

Q.51 The dimensions of a soil sampler are given in the table.

Parameter	Cutting edge	Sampling tube
Inside diameter (*mm*)	80	86
Outside diameter (*mm*)	100	90

For this sampler, the outside clearance ratio (in *percent, round off to 2 decimal places*) is _____

Q.52 A 2 *m* × 4 *m* rectangular footing has to carry a uniformly distributed load of 120 *kPa*. As per the 2:1 dispersion method of stress distribution, the increment in vertical stress (in *kPa*) at a depth of 2 *m* below the footing is _____

Q.53 Constant head permeability tests were performed on two soil specimens, *S1* and *S2*. The ratio of height of the two specimens (L_{S1}:L_{S2}) is 1.5, the ratio of the diameter of specimens (D_{S1}:D_{S2}) is 0.5, and the ratio of the constant head (h_{S1}:h_{S2}) applied on the specimens is 2.0. If the discharge from both the specimens is equal, the ratio of the permeability of the soil specimens (k_{S1}:k_{S2}) is _____

Q.54 A timber pile of length 8 *m* and diameter 0.2 *m* is driven with a 20 *kN* drop hammer, falling freely from a height of 1.5 *m*. The total penetration of the pile in the last 5 blows is 40 *mm*. Use the Engineering News Record expression. Assume a factor of safety of 6 and empirical factor (allowing reduction in the theoretical set, due to energy losses) of 2.5 *cm*. The safe load carrying capacity of the pile (in *kN, round off to 2 decimal places*) is _____

Q.55 A square footing of 2 *m* sides rests on the surface of a homogeneous soil bed having the properties: cohesion c = 24 *kPa*, angle of internal friction ϕ = 25°, and unit weight γ = 18 kN/m^3. Terzaghi's bearing capacity factors for ϕ = 25° are N_c = 25.1, N_q = 12.7, N_γ = 9.7, N_c' = 14.8, N_q' = 5.6, and N_γ' = 3.2. The ultimate bearing capacity of the foundation (in *kPa, round off to 2 decimal places*) is _____

END OF THE QUESTION PAPER