Max. Marks: 60

"Students governed by the old ordinance will be examined out of 75 marks and their obtained marks shall be proportionately raised."

Note: Answer any five questions by selecting at least two questions from each section. Standard normal distribution chart is attached.

SECTION – 'A'

1. (a) Solve by Frobenius method:
   \[ x^2 y'' + x y' + (x^2 - 1) y = 0 \]
   
   (b) Prove the following recurrence relation:
   \[ (n + 1)P_n(x) = P_{n+1}(x) - xP_n'(x) \]
   
   [6+6]

2. (a) Find the values of \( P_n(-1), P_{2n+1}(0) \) and \( P_{2n}(0) \)
   
   (b) Prove the recurrence relation:
   \[ T_{n+1}(x) + T_{n-1}(x) = 2x T_n(x) \]
   
   [6+6]

3. (a) Prove that \[ \mathcal{F}[x^n f(x)] = \left. \frac{d^n}{dw^n} F(w) \right|_{w=x} \]
   where \( F(w) \) is the Fourier transform of \( f(x) \) i.e., \( \mathcal{F}[f(x)] = F(w) \).
   
   (b) Find the Fourier transform of
   \[ f(x) = e^{-4(x-1)^2} \]
   
   (c) Find the Hannel transform of
   \[ f(x) = \begin{cases} 
   x^n, & 0 < x < a, \quad n > -1 \\ 
   0, & x \geq a, \quad n > -1 
   \end{cases} \]
   
   [4+4+4]

4. (a) Solve the following linear programming problem by graphical method.
   
   Minimize \[ Z = 3x_1 + x_2 \]
   subject to \[ \begin{align*}
   8x_1 + x_2 & \geq 8 \\
   2x_1 + x_2 & \geq 6 \\
   x_1 + 3x_2 & \geq 6 \\
   x_1 + 6x_2 & \geq 8 \\
   x_1, x_2 & \geq 0
   \end{align*} \]
   
   Contd....2,
(b) Solve the following linear programming problem by simplex method

Maximize \( Z = -2x_1 - 3x_2 + 5x_3 \)
subject to
\[
\begin{align*}
-2x_1 + x_2 + x_3 & \leq 8 \\
3x_1 - 2x_2 & \geq -18 \\
2x_1 + x_2 - 2x_3 & \leq -4 \\
x_1, x_2, x_3 & \geq 0
\end{align*}
\]

SECTION ‘B’

5. (a) Suppose that A and B are events for which \( P(A) = x \), \( P(B) = y \) and \( P(A \cap B) = z \). Find \( P(\overline{A} \cap B) \), \( P(A \cup B) \) and \( P(\overline{A} \cup \overline{B}) \).

(b) A lot consists of 20 items. 4 items are defective. Two items are chosen at random. Find the probability that
(i) both are defective
(ii) at least one is defective
(iii) at most one is defective

6. (a) Given \( P(A) = 0.4 \), \( P(B) = 0.5 \) and \( P(A \cap B) = 0.1 \).
Calculate \( P(A|B) \), \( P(A|B) \), \( P(B|A) \) and \( P(\overline{B} | A) \).

(b) In a bolt factory, machines A, B, C and D manufacture 20, 30, 35, and 15 percent of the total output, respectively. Of their outputs, 4, 5, 3 and 2 percent, respectively are defective bolts. A bolt is chosen at random and found to be defective. What is the probability that the bolt came from machine B?, C?.

7. (a) From a lot containing 20 items, 5 of which are defective, 3 are chosen at random. Let \( X \) be the number of defectives found. Obtain the probability distribution of \( X \) if
(i) the items are chosen with replacement.
(ii) the items are chosen without replacement

(b) The diameter of an electric cable, say \( x \), is assumed to be a continuous random variable with pdf
\[ f(x) = 6x(1-x), \quad 0 \leq x \leq 1, \]
(i) Check that \( f(x) \) is a pdf
(ii) Determine ‘a’ such that \( P(x > a) = 2P(x < a) \)
(iii) Calculate \( P(x < \frac{3}{4} \mid \frac{1}{2} \leq x \leq \frac{7}{8}) \)

8. (a) Suppose that \( x \) has distribution \( N(5, 9) \). Find a number ‘a’ such that
\[ P(x \leq a) = 3P(x > a) \]

(b) The diameter of an electric cable is normally distributed with mean 0.8 and variance 0.0009. The cable is defective if the diameter differs from its mean by more than 0.02. If 3 such cables are chosen, find the probability that at least one of them is defective.

(c) The errors in a certain length – measuring device are normally distributed with \( N(9, 1) \). What is the probability that the error in measurement will be greater than 2?, less than 4?

Chart attached
Contd……..3
2012 – 2013
M.TECH. WINTER (II SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
(HYDRAULIC STRUCTURES)
COMPUTATIONAL FLUID DYNAMICS
(AM - 612)

Marks: 60
Duration: Three Hours

Answer five questions in all selecting at least two from each section.
All numerical calculations are to be carried out upto four decimal places.

SECTION – ‘A’

(a) Derive Cauchy-Riemann equations of \( f(z) \) expressed in polar coordinates.

(b) Show that the function \( U = \frac{1}{2} \log(x^2 + y^2) \) is Harmonic and determine its conjugate.

(c) Determine the analytic function

\[
F(z) = u(x, y) + iv(x, y), \text{ if } u + v \text{ is given to } \frac{2\sin 2x}{e^{2y} + e^{-2y} - 2\cos 2x} \]

[4,4,4]

(d) Find the Laurent’s series which represents the function:

\[
\frac{1}{(1 + z^2)(z + 2)}
\]

(i) When \(|z|<1\)  (ii) When \(1<|z|<2\),  (iii) When \(|z|>2\)

Find poles, their orders and residues of \( \frac{z^2 - 2z}{(z + 1)^2(z^2 + 4)} \) at its poles in the finite plane.

(b) Find the complex potential, the velocity potential, and the Stream function for a source and a sink of strength \(2\pi\) located, respectively at \(z = -1\) and \(z = 1\) in uniform flow of strength \(1\)

(i) In the direction of the positive \(x\)-axis
(ii) In the direction of the positive \(y\)-axis.

Show that the velocity potential

\[
\phi = \frac{1}{2} \log \frac{(x + a)^2 + y^2}{(x - a)^2 + y^2}
\]
gives a possible motion. Determine the form of streamlines and curves of equal speed.

[6,6]

If the point vortex whose complex potential is \( f(z) = -\left(\frac{ik}{2\pi}\right) \log z \) is superimposed on the flow whose complex potential is given by

\[
F(z) = -Uz - \frac{\mu}{2\pi z},
\]

Determine the stagnation points of the flow. How do the stagnation point vary with \(K\)?

Contd….2,"
(b) In case of the two dimensional fluid motion produced by a source of strength \( m \) placed at a point \( S \) outside the rigid circular disc of radius \( a \) whose centre is \( O \), show that the velocity of slip of the fluid in contact with the disc is the greatest at the point where the line joining \( S \) to the ends of the diameters at right angle to \( OS \) cut the circle: and prove that its magnitude at this point is

\[
\frac{2m \cos \theta}{(a^2 - \theta^2)}
\]

SECTION – ‘B’

5. (a) Find a root of the system of nonlinear equations

\[
\begin{align*}
 x^2 + y &= 11 \\
 y^2 + x &= 7
\end{align*}
\]

In first quadrant correct to 2-decimals by general iterative method.

(b) The system of nonlinear equations

\[
\begin{align*}
 y \cos(xy) + 1 &= 0 \\
 \sin(xy) + x - y &= 0
\end{align*}
\]

Has one solution close to \( x = 1, y = 2 \). Use two iterations of Newton-Raphson’s method to calculate this solution.

6. Obtain a two parameter solution of the BVP

\[
 u'' + u = x^2, \quad u(0) = 0, \quad u(2) = 4
\]

by (a) Galerkin’s method

(b) Rayleigh – Ritz method

7. (a) Solve the following system of differential equations

\[
\begin{align*}
 \frac{dx}{dt} &= -3x + 2y \\
 \frac{dy}{dt} &= 3x - 4y
\end{align*}
\]

with \( x(0) = 0, y(0) = 0.5 \) for \( h = 0.2 \) on the interval \([0, 0.4]\) by Runge-Kutta method of order 4.

(b) Solve the heat conduction equation

\[
\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}
\]

subject to boundary conditions

\[
 u(0, t) = 0 = u(1, t), \quad u(x, 0) = x^2 - x^2
\]

by using Crank-Nicolson scheme for \( h = 0.25, k = 0.025 \) in two time steps.

8. (a) Solve \( \nabla^2 u = 0 \) for the region bounded by square \( 0 \leq x, y \leq 4 \) with boundary conditions

\[
\begin{align*}
 u &= 0 \quad \text{at } x = 0, \quad u = 8 + 2y \quad \text{at } x = 4 \\
 u &= \frac{x^2}{2} \quad \text{at } y = 0, \quad u = x^2 \quad \text{at } y = 4
\end{align*}
\]

With \( h = 1 = k \), use two iterations of Gauss-Seidel’s method to compute the values of \( u \) at internal mesh points.

(b) Solve the equation \( \frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2} \) subject to the following boundary conditions

\[
\begin{align*}
 u(0, t) &= 0 = u(1, t) \quad (t > 0) \\
 \frac{\partial u}{\partial t}(x, 0) &= 0, \quad u(x, 0) = \sin^3 \pi x, \quad 0 < x \leq 1.
\end{align*}
\]

For two time levels with \( h = 0.25, k = 0.2 \).
2012-13
M.TECH. (WINTER SEMESTER) EXAMINATION
CIVIL
FINITE ELEMENT ANALYSIS
CE - 606

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No. | Question | M.M.
--- | --- | ---
1 | Develop the transformation matrix in global coordinate system for the prismatic bar as shown in the Fig. 1 below: | [15]

![Fig. 1](image)

OR

1' | Write notes on any three of the following:
   (a) Rayleigh-Ritz method
   (b) Constant Strain Triangle (CST or T3)
   (c) Plain stress and plain strain
   (d) Global stiffness matrix
   (e) Shape functions | (15)

2 | Determine the eigenvalues and eigen vectors for the stepped bar as shown in Fig. 2 below. | [15]

![Fig. 2](image)

Contd.......2
Cond.......

(d) the force in the spring 4
(e) the reaction forces at nodes 4 and 5
γ (a) the displacement of nodes 2 and 3
\[ \text{Find the global stiffness matrix} \]

For the spring system shown below in Fig. 4.

\[ \begin{align*}
\mathbf{u}_4 &= u_4 = 0 \\
\mathbf{F}_1 &= 300 \text{ N}, \mathbf{F}_2 &= 200 \text{ N} \\
\mathbf{k}_1 &= 200 \text{ N/mm}, \mathbf{k}_2 &= 150 \text{ N/mm}, \mathbf{k}_3 &= 175 \text{ N/mm} \\
\end{align*} \]

OR

\[ \begin{align*}
\text{For the system shown below in Fig. 3.}
\end{align*} \]

\[ \mathbf{E} = 210 \text{ GPa}, \mathbf{I} = 2 \times 10^4 \text{ m}^4 \]
\[ \mathbf{p} = 50 \text{ KN}, \mathbf{X} = 200 \text{ KN/m}, \mathbf{L} = 3 \text{ m} \]

\[ \text{Find the deflection, reactions and reaction forces for the assembly shown in the Fig.} \]

\[ \text{(15)} \]
4(a) Evaluate the shape functions $N_1$, $N_2$, and $N_3$ at the interior point $P$ as shown in Fig. 5. Also determine the Jacobian of the transformation $J$ for the triangular element below.

\[ \text{Fig. 5} \]

4(b) The beam shown in Fig. 6 below is clamped at the two ends and acted upon by force $P$ and moment $M$ in the mid span. Find the deflection and rotation at centre node and reaction forces and moments at the two ends.

\[ \text{Fig. 6} \]
1(a) For the shaft shown in Fig1, determine the natural frequency of vibration. Assume
\[ N = 8 \times 10^5 \text{N/cm}^2 \] and mass moment of inertia \( I_n = 1500 \text{ N/cm}^2 \). Neglect the weight of the shaft.

1(b) A platform of weight 20,000N is supported on four equal columns which are fixed to the foundations as well as to the platform. Experimentally it is found that a force of 5000N applied horizontally to the platform produces a displacement of 0.2cm. It is estimated that damping in the structure is of the order of 5 percent of critical damping. Determine (a) undamped natural frequency (b) absolute damping coefficient (c) logarithmic decrement and (d) the number of cycles and the time required for the amplitude of motion to be reduced from an initial value of 0.2cm to 0.02cm.

2(a) A simple beam consisting of two ISLB250 having moment of inertia 3717.8cm^4, supports at its centre a machine having a weight \( W = 80,000 \text{N} \). The beam has span of 3m. The motor runs at 400rpm and its rotor is out of balance to the extent of \( W' = 200 \text{N} \) at an eccentricity of 20cm. What will be the amplitude of the steady state response if the damping ratio is 0.2. Neglect the weight of the beam. Find also the dynamic amplification factor. Take \( E = 200 \text{Gpa} \)

2(b) A machine of weight \( W = 2000 \text{N} \) and making 150rpm is supported by 4 helical springs made of steel wire of diameter \( d = 12 \text{mm} \). The diameter corresponding to the centreline of the helix is \( D = 100 \text{mm} \) and the number of coils = 10. Determine the maximum vertical disturbing force transmitted to the foundation if the centrifugal force of unbalance for the angular speed equal to 1rad/sec is \( P = 5 \text{N} \). Take damping ratio = 0.05 and modulus of shear \( G = 0.8 \times 10^3 \text{N/cm}^2 \).

Contd.....
3(a) Determine the first three terms of the Fourier Series expansion for the time varying force as shown in Fig. 2.

3(b) Using Green's theorem, derive the response (displacement) time equation for suddenly applied load.

4 A single degree of freedom system has a mass of 500kg, damping 5% and stiffness 20kN/m. It is subjected to a wind force as shown in Fig. 3. The system is initially at rest. Determine the displacement, velocity and acceleration upto 0.5sec if \( \delta t = 0.1 \)sec. Use New
5  Determine the natural frequency and mode shapes (up to 3rd mode) for the system shown in Fig. 4. Use matrix iterative procedures.

![Diagram of a 3-storey shear frame with masses and stiffnesses]

6  Using the Eigen-Vectors for the four storey shear frame, find modal participation factors and effective masses for all the four modes with the following data:

\[
[M] = \begin{bmatrix}
0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 \\
\end{bmatrix} \quad \begin{bmatrix}
0.0914 \\
0.187 \\
0.264 \\
0.305 \\
\end{bmatrix} \quad \begin{bmatrix}
0.185 \\
0.207 \\
-0.074 \\
-0.300 \\
\end{bmatrix} \quad \begin{bmatrix}
0.279 \\
-0.164 \\
-0.134 \\
0.150 \\
\end{bmatrix} \quad \begin{bmatrix}
0.068 \\
-0.141 \\
0.396 \\
-0.280 \\
\end{bmatrix}
\]
2012-13
M.TECH. (WINTER SEMESTER) EXAMINATION
CIVIL
ADVANCED STEEL DESIGN
CE - 608

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No. Question M.M.

1 A Through type (Warren Truss with verticals) as shown in Fig. 1 is provided for single broad gauge track. The effective span of the bridge is 45 m. The cross-girders are spaced 4.5 m apart. The stringers are spaced 2 m between centre lines. 0.6 kN per metre stock rails and 0.45 kN per metre check rails are provided. Sleepers are spaced at 0.45 m from centre to centre and are of size 2.8 m x 0.30 m x 0.25 m. Weight of timber may be assumed as 7.5 kN per cubic metre. The main girders are provided at a spacing of 7 m between their centre lines. Design any inclined (diagonal) member. The bridge is to carry standard main line loading.

Note: Equivalent Uniformly Distributed Live Loads (EUDLL) on Each Track and Impact Factors for Broad Gauge Bridge of Span 45 m:
Total Load for B.M. = 3995 kN
Total Load for S.F. = 4301 kN
Impact Factor = 0.339

2 A microwave tower of 50 m height as shown in Fig. 2 is proposed over a hill top. The height of the hill is 50 m with a gradient of 1 in 4. The terrain category is 3. The tower is proposed at Coimbatore. Calculate the design wind pressure in top panel. The tower is mounted with a hollow hemispherical dome of 2 m diameter weighing 10 kN. Compute the wind forces in the various members of the top panel as per IS 875.

Contd……..2
2' A self supporting steel stack is 90 meters high and its diameter at the top is 3.5 metres. Fix the other dimensions as per IS: 6533. Also design the thickness of the plates at 20 metres from top. The location of the place is such that the intensity of wind pressure up to 30 metres height is 1.5kN/m² and linearly increases to 1.9 kN/m² at the top of the chimney.

3 An overhead riveted steel rectangular flat bottom tank is of capacity 90,000 litres. The staging consists of 4 columns and the bottom of the tank is 10 m above the ground level. The available width and length of plate are 1.25 m and lengths up to 6.5 m. Design the thickness of the tank plate, T-covers at butt joints of the plates and stays for the vertical wall.

The permissible stress in direct tension for water tanks = 0.8 x 0.6 \( \sigma_y = 0.48 \sigma_y \)

Bending tension and bending compression in plates = 0.8 x 0.66 \( \sigma_y = 0.528 \sigma_y \)

4 A continuous beam is loaded with ultimate loads as shown in Fig. 3. Design the beam, if the section is different for each span, to achieve maximum economy. Take \( \sigma_y = 250 \text{ N/mm}^2 \).

OR

4(a) Discuss the role of temperature and dislocation density on the brittle fracture of steel.

4(b) Write a brief note on Fatigue of steel and brittle fracture.
Maximum Marks: 60

Note: (i) Answer any Five Questions
(ii) All parts of a question should be attempted in one continuation
(iii) All questions carry equal marks

Q. 1 (a) Discuss various elements of purchasing with the help of suitable example. (6)

(b) How arbitration Board is formed. How arbitration proceedings are conducted. (6)

Q. 2 (a) Describe various functions and objectives of materials management. (4)

(b) Discuss the following in detail (8)

(i) Vendor Management
(ii) Waste Management

Q. 3 (a) What is the procedure to invite Tender ? (4)

(b) What are the Lump Sum Contract. What are the special features of Lump Sum Contract? (8)

Q. 4 (a) Write down a brief account on profile of construction industry in India. (6)

(b) Discuss inherent characteristic of construction project in detail. (6)

Q. 5 (a) Define and discuss various types of estimates with degree of accuracy and its uses. (6)

(b) Explain the following costs with example (6)

(I) Fixed Cost (ii) Variable Cost (iii) Installed Cost (iv) Historical Cost (v) Imputed Cost
(vi) Attendant Cost

Contd………2
Q.6 (a) In what ways purchasing of Capital Construction Equipment is different from routine purchasing. Discuss in detail (4)

(b) What are the various issues to be examined during the purchase of construction equipment? Discuss in detail (8)

Q.7 (a) Explain the phrase “Estimate is an opinion, Price is a policy and Cost is a fact.” (6)

(b) Explain the following terms in context of accounting: (6)

(i) Equity
(ii) Liability
(iii) Asset
(iv) Creditors
(v) Debtors
(vi) Revenue
2012-13
M.TECH. (II SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
(HYDRAULIC STRUCTURES)
ADVANCED ENGINEERING HYDROLOGY
CE-616

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No. Question M.M.
1(a) Define the following terms:
   (i) Probable Maximum Flood (ii) Return period and Exceedence probability
1(b) Differentiate between risk, reliability and safety factors.

OR

1' A drainage basin of area 600 Km² has experienced an 8-h storm with rainfall intensities of 3 and 2 cm/h in successive periods of 4-h each. The distribution ratios of the distribution graph for storms of 4-h duration are 0.05, 0.15, 0.30, 0.20, 0.13, 0.09, 0.055 and 0.025. Determine the ordinates of discharge hydrograph. Assume an average Φ-index of 1.0 cm/h and neglect base flow.

2(a) Describe various methods of base flow separation.
2(b) What do you mean by centre of storm? Give step-wise procedure of drawing a Depth – Area –Duration curve.

OR

2' The ordinates of a 4-h U.H. of a basin of area 300 Km² measured at 1-h intervals are 5,5,35,65,90,105,92,78,67,57,48,40,33,26,22,16,12,8,5,2 and 1 m³/s respectively. Obtain the ordinates of a 5-h U.H. for the basin using the S-curve technique.

3 Write short notes on any two of the following:
   (i) Methods of measurement of stage of a river. (ii) Double Mass curve technique (iii) Significance of unit hydrograph.

Contd......2
Characteristics of two catchments M and N measured from a map are given below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Catchment M</th>
<th>Catchment N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lc</td>
<td>76 Km</td>
<td>52 Km</td>
</tr>
<tr>
<td>L</td>
<td>148 Km</td>
<td>106 Km</td>
</tr>
<tr>
<td>A</td>
<td>2718 Km²</td>
<td>1400 Km²</td>
</tr>
</tbody>
</table>

For the 6-h unit hydrograph in catchment M, the peak discharge is at 200 m³/s and occurs at 37 h from start of the rainfall excess. Assuming the catchments M and N are meteorologically similar; determine the elements of the 6-h synthetic unit hydrograph for catchment N by using Synder’s method.

5(a) What do you mean by flood routing?

5(b) Route the flood hydrograph through a river reach and derive the outflow hydrograph. The value of K and x for the reach may be taken as 12h and 0.278 respectively. Assume outflow 42 m³/s at the start of inflow. The ordinates of inflow hydrograph are given below:

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>0</th>
<th>4</th>
<th>8</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>24</th>
<th>28</th>
<th>32</th>
<th>36</th>
<th>40</th>
<th>44</th>
<th>48</th>
<th>52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflow (m³/s)</td>
<td>42</td>
<td>68</td>
<td>116</td>
<td>164</td>
<td>194</td>
<td>200</td>
<td>192</td>
<td>170</td>
<td>150</td>
<td>128</td>
<td>106</td>
<td>88</td>
<td>74</td>
<td>62</td>
</tr>
</tbody>
</table>
SHEET NO. : 01

2012 - 2013

M. TECH. II YEAR (WINTER-SEMESTER) EXAMINATION

CIVIL ENGINEERING

HYDRAULIC STRUCTURES

HYDRO-POWER STRUCTURES

CE-617

Maximum Marks: 60 Credit: 04 Duration: Three Hours

Answer all the questions.

Assume suitable data if missing.

Notations used have their usual meaning.

Q. No. Question Mark

Q1(a) Write the function of the following:

(i) Trash rack
(ii) Surge tank
(iii) Head race tunnel
(iv) Manifold

Q1(b) List out any three sources of non-conventional energy in nature.

Draw the neat sketch of a solar or a tidal power plant. Give two examples of such plants working in India.

Q1(c) Draw the nature of load curve, power duration curve, mass curve, demand curve and flood hydrograph.

Q2 Explain load factor and utilization factor. Using following data, construct and plot the power duration curve for a hydel plant. What is firm power of the plant?. It is intended to enhance the firm capacity of this

Contd.....
plant by 20 %, what should be the capacity of reservoir to meet this
demand in ha-m?

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Q (m³/s)</td>
<td>145</td>
<td>999</td>
<td>973</td>
<td>690</td>
<td>381</td>
<td>279</td>
<td>249</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Month</th>
<th>Feb.</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q (m³/s)</td>
<td>186</td>
<td>173</td>
<td>169</td>
<td>160</td>
<td>153</td>
</tr>
</tbody>
</table>

The gross head available at the site is 60 m. The total head lost is 5 m.

Specific weight of water may be taken as 10000 N/m³. Take overall
efficiency of the plant as 88 %.

Q3(a) How tunnels are classified based on shape and constructional features?

Q3 (b) What are various types of head losses in trash rack?. How these may be
minimised.

OR

Q43(a) Discuss the design features of a hydraulic tunnels. Design a tunnel
using following data:

Max. Discharge = 100 m³/s

Limiting velocity = 7 m/s

Tunnel section may be assumed as circular in shape with smooth
surface from inside. Assume other data if required.

Q34(b) How penstocks are classified based on methods of support.? Discuss

Various empirical approaches to design a steel penstock.
Q4 Differentiate between elastic and rigid column theories of water hammer. Derive the expressions for height of maximum upsurge and down surge as well as for time of oscillation for a simple surge tank taking usual notations

Q5 (a) What are the main purposes of providing a surge tank in hydro power plants? Give two examples of surge tanks which have been provided in India or abroad with their basic hydraulic and structural data.

Q5 (b) A pipe line (length 762 m, internal diameter as 150 cm) is connected with a reservoir. The pipe is kept horizontal. The H.F. L. in the reservoir is at an elevation of 210.0 m. The elevation of the centre of the pipe is 164.5 m. Assuming frictionless system answer the following:

(i) What is the maximum pressure at the control gate if the initial steady flow of 0.045 m³/s is cut-off uniformly in 10 seconds.

(ii) What is the factor of safety if the bursting strength is 2600 kN/m²?

Q6 Write short notes on any THREE of the following:

(a) Specific speed of turbines
(b) Runoff- river plants
(c) Underground power houses
(d) Spiral casings
(e) Dimensioning of power houses
(f) Draft tubes
Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No. Question M.M.
1(a) Briefly describe the necessity of biological treatment.  [02]
1(b) A lagoon capacity 4000 m$^3$ filled with water starts receiving waste, COD 3000 mg/L at a rate of 200 m$^3$/d. If the organic matter decomposes according to first order reaction rate constant of 0.05 per day. What would be the COD of the effluent after 10, 30 and 40 days?  [05]
1(c) Compare the efficiencies of organic matter removal of a single CSTR of HRT 12 days, two CSTRs in series each having an HRT of 6 days, 4 CSTRs each having HRT of 3 days and a PFTR of HRT of 12 days in series. Assume the organic matter decomposition takes place according to a first order reaction with a rate constant equal to 0.1 per day  [5]

OR

1'(a) Draw the hydraulic profiles of a CSTR and PFTR receiving pulse and continuous inputs of tracer  [04]
1'(b) A completely mixed reactor receives influent containing 10 mg/l of tracer for 2 hours. The tracer addition is terminated but the flow remains steady. The volume of the reactor is 10 L. And the flow rate is 2L/h. What is the concentration of tracer in the reactor 1 h after tracer addition is terminated? The reactor had an initial concentration of tracer of 1.0 mg/L when tracer addition commenced.  [04]
1'(c) Derive the equation for effluent concentration of a tracer undergoing decay in a...
PFTR, the flow of tracer being continuous.

2(a) Define the various kinetic coefficients involved in biological treatment. Also describe their significance in wastewater treatment.

2(b) What is the advantage of recycle of cells in a biological reactor?

2(c) Derive the equations of microbial growth and substrate utilisation. Find the doubling time of a microbial species having a $\mu_{max}$ value of 3.1 per hour.

3(a) Define $\theta_e^{min}$ and derive its equation.

3(b) Derive the equations of $X$ and $S$ for a CSTR with cells recycle and $Q_r$ in an activated sludge process.

3'(a) Describe the different modified forms of an activated sludge process.

3'(b) Describe the biological denitrification process. Calculate the methanol requirement for denitrification reactor, the characteristics of the effluent from the nitrification reactor is as follows:

$NO_2^-$-N = 1.6 mg/L, $NO_3^-$-N = 15.5 mg/L and D.O. = 3.2 mg/L. The flow of wastewater may be taken as 10,000 m$^3$/d.

4(a) Design a two stage high rate trickling filter for the treatment of 20 MLD of wastewater, the initial BOD may be taken as 180 mg/L and an overall BOD removal efficiency of 85% is required. Assume $R$ = 1.

4(b) Describe the functioning of Rotatory Biological Contact (RBC) process. Also draw the sketch of the reactor.

5(a) Differentiate between the different types of pond systems used in biological treatment. Design a stabilization pond for the treatment of 10 MLD of sewage having a BOD of 2100 mg/L. Take the value of BOD loading as 160 Kg BOD/ha.d.

5(c) Discuss in detail the nutrient requirement in anaerobic treatment. Also describe the toxicity of ammonia in anaerobic treatment.
Maximum Marks: 60

Answer all the questions. Assume suitable data if missing. Notations used have their usual meaning.

Q.No.  Question                                                                                         M.M.
1(a).  What are the main parameters in industrial wastewater characterization? List important prescribed standards for the disposal of treated waste in water bodies and, on land for irrigation. [06]
1(b).  Discuss the purpose of equalization and neutralization in industrial wastewater treatment. Describe in short, the various methods of neutralization of wastewater. [06]

OR

1'(a). What is the purpose of conducting industrial survey? List the information collected in this survey. How does it help in waste management? [06]
1'(b). Explain the following:
   (i) significance of mass balance calculations in industrial waste survey
   (ii) segregation of various streams for industrial effluent treatment [06]

2. Briefly describe the manufacturing process in Chlor-Alkali industry. How the wastewater stream containing mercury is treated? How much mercury is consumed in a plant producing 30,000 Tonnes NaOH/year? Make a mass balance for mercury in this plant and calculate mercury losses through different major routes. [12]

OR

2'. Design an activated sludge process for a sugar mill discharging 2000m$^3$/d wastewater having a BOD of 1500 mg/l. Your design should include aeration tank volume, excess

Contd........
sludge amount, sludge recirculation and oxygen requirement. Assume, efficiency of BOD removal - 90%, $\theta_c$ - 5 days, $k_d$ - 0.05 d\(^{-1}\), $Y$ - 0.5, $X$ - 2000 mg/l, $X_s$ - 10,000 mg/l.

3. For the following data, find out the minimum equalization volume required and also find out equalized flow rate and organic loading.

<table>
<thead>
<tr>
<th>Time (hrs)</th>
<th>Flow (m(^3)/s)</th>
<th>BOD (mg/l)</th>
<th>Time (hrs)</th>
<th>Flow (m(^3)/s)</th>
<th>BOD (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>0.275</td>
<td>150</td>
<td>12-13</td>
<td>0.425</td>
<td>220</td>
</tr>
<tr>
<td>1-2</td>
<td>0.220</td>
<td>115</td>
<td>13-14</td>
<td>0.405</td>
<td>210</td>
</tr>
<tr>
<td>2-3</td>
<td>0.165</td>
<td>75</td>
<td>14-15</td>
<td>0.385</td>
<td>200</td>
</tr>
<tr>
<td>3-4</td>
<td>0.130</td>
<td>50</td>
<td>15-16</td>
<td>0.350</td>
<td>190</td>
</tr>
<tr>
<td>4-5</td>
<td>0.105</td>
<td>45</td>
<td>16-17</td>
<td>0.325</td>
<td>180</td>
</tr>
<tr>
<td>5-6</td>
<td>0.100</td>
<td>60</td>
<td>17-18</td>
<td>0.325</td>
<td>170</td>
</tr>
<tr>
<td>6-7</td>
<td>0.120</td>
<td>90</td>
<td>18-19</td>
<td>0.330</td>
<td>175</td>
</tr>
<tr>
<td>7-8</td>
<td>0.205</td>
<td>130</td>
<td>19-20</td>
<td>0.365</td>
<td>210</td>
</tr>
<tr>
<td>8-9</td>
<td>0.355</td>
<td>175</td>
<td>20-21</td>
<td>0.400</td>
<td>280</td>
</tr>
<tr>
<td>9-10</td>
<td>0.410</td>
<td>200</td>
<td>21-22</td>
<td>0.400</td>
<td>305</td>
</tr>
<tr>
<td>10-11</td>
<td>0.425</td>
<td>215</td>
<td>22-23</td>
<td>0.380</td>
<td>245</td>
</tr>
<tr>
<td>11-12</td>
<td>0.430</td>
<td>220</td>
<td>23-24</td>
<td>0.345</td>
<td>180</td>
</tr>
</tbody>
</table>

4(a). A distillery producing 6 kl/d alcohol consumes furnace oil at the rate of 130 kg/hr. Calculate energy recovery potential, given: spent wash COD 1,00,000 mg/l, waste flow 90 m\(^3\)/d, efficiency of COD removal 65%, calorific value of methane 8550 kcal/m\(^3\), calorific value of furnace oil 9588kcal/l.

4(b). For a tannery processing 500 hides everyday, calculate the spent chrome tan liquor generated. How much basic chromium sulphate is consumed and discharged in waste annually? Suggest a methodology to be adopted for chromium recovery.

5. Describe the manufacturing process, points of waste generation along with characteristics of wastewater for any two of the following industries. Also sketch the treatment plant flowsheet for these industries.

(i) Brewery
(ii) Dairy
(iii) Slaughterhouse
(iv) Tannery
2012-2013
M.Tech (II nd Semester) Examination
(Civil Engineering)
Environmental Engineering
WASTEWATER TREATMENT PLANT DESIGN AND OPERATIONS
CE-629

Duration: Three Hours
Maximum Marks: 60

Attempt/Answer all the questions.
Assume suitable data, in case if not given or missing
Notations used have their usual meanings.

Q.No. 1a Explain different types of screens in accordance with their applicability and function for municipal wastewater treatment. 05

Q.No. 1b Differentiate in between centrifugal and submersible pumps for lifting the wastewater with their advantages and disadvantages. 05

Q.No. 1c What is the purpose of proportional weir in the inlet system of wastewater treatment facility? Describe in brief its design principle and neatly show typical schematic with its features. 05

Q.No. 2 Carry out a detailed design of manual screen chamber and grit removal for the flow of 12.5 MLD when size of grit particle is 0.15 mm and specific gravity is 2.65. Assume width of rectangular bar as 12mm and clear spacing of 25mm for screens. Peak factor for discharge is 2.0. 10

OR

Q.No. 2' What is the principle of settling of particles in the sedimentation tank? Design a primary sedimentation tank (circular or rectangular) for wastewater treatment plant for a flow of 12.5 MLD when your TSS concentration is about 350 mg/l. Your design should essentially include size / diameter of the tank, retention time, water depth & free board, length of effluent weir, number of V-notches, head over V-notch, and width of effluent launder. 10

Q.No. 3 i. On what basis biological systems for wastewater treatment are classified? Write general chemical equations showing digestion process for this classification. 05

Contd......2
ii. Explain with the help of flow diagram the following processes:
   a) Sequencing Batch Reactor
   b) Moving Bed Bioreactor
   c) Activated Sludge Process
   d) Membrane Bioreactor

Q.No. 4 Design a sewage treatment plant based on UASB Technology to treat flow of 12.5 MLD for influent BOD of 250 mg/l, TSS 400 mg/l, and COD 450 mg/l. The outlet BOD and TSS concentration should be less than 20 mg/l and 50 mg/l respectively. Your design should include the following units:
   a) UASB Reactors
   b) Final Polishing Pond
   c) Chlorine Contact Tank
   d) Sludge Drying Beds
   Prepare a layout plan showing flow scheme for these treatment units.

Q.5' Write brief notes on any four of the following:
   i. Membranes and their Types
   ii. Merits and Demerits of SBR and UASB in the Indian context
   iii. Significance of BOD
   iv. Attached, Suspended and Submerged Growth Systems with their examples
   v. Gravity Sewer, Rising Main, and Highest Flood Level of River
2012-13
M.TECH. (II SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
STRUCTURAL ENGINEERING
ADVANCED CONSTRUCTION MATERIALS
(CE-642)

Maximum Marks: 60 Credits: 04 Duration: Three Hours

Answer any five questions.
All questions carry equal marks

Q.No.       Question                                                                 M.M.
1(a) Define seasoning of timber. How is seasoning done on large scale?  [05]
1(b) What are the characteristics of good paints?  [02]
1(c) Describe various defects in timber.  [05]

2(a) What are the ingredients used in oil paints? State the function of each of them.  [04]
2(b) What is varnish? What are its ingredients and where it is used?  [03]
2(c) Describe the structure and growth of an exogenous tree.  [05]

3. Write short note on any three of the followings: [12]
   (i) Preservation of timber.
   (ii) Defects in painting.
   (iii) Gypsum.
   (iv) Structural steel.
   (v) Seasoning of timber.

4(a). Define Ferrocement. What are its main constituents?  [04]
4(b). Discuss in details the factors affecting the properties of Fibre Reinforced Concrete (FRC).  [08]

Contd.......2
5(a). What are the advantages and disadvantages of Ferrocement? Write down the normal ranges of composition of Ferrocement.

5(b). Discuss the suitability of Ferrocement material system for repair, retrofitting and re-strengthening of distressed structural elements.

5(c). What do you understand by Fibre Reinforced Concrete (FRC)? What are the merits of using FRC over the Conventional Reinforced Concrete?

6(a). Mention some of the commonly used fibres in FRC and their relative advantages and disadvantages.

6(b). Explain the mechanism of Fibre-Matrix Interaction in FRC under tensile load.

6(c). Briefly mention the main application of Ferrocement.

7(a) With neat sketches, explain various types of wire meshes used in Ferrocement.

7(b) Discuss the factors affecting the cracking behaviour of Ferrocement.

7(c) Enumerate the main factors that affect the reinforcement corrosion in FRC.

8. Write short note on any three of the followings:
   (i) Stress—strain curve of Ferrocement under tension.
   (ii) Polymer concrete.
   (iii) Glass Fibre Reinforced Cement (GRC).
   (iv) Stress—strain curve of FRC under tension.
   (v) Enamel.
Answer all the questions. 
Assume suitable data if missing. 
Notations used have their usual meaning. 
Use of IS:875(Part-III) and IS 1893 (2002) is permitted.

Q. No. Question M.M. 
1. Discuss in detail various types of vertical and lateral load resisting system used in tall buildings. [15] 

2(a). What are the various effects induced by the wind in tall buildings. Elaborate at length the dominance of each of them with reference to the geometry of the tall building. [12] 

2(b). Enumerate the idealisation made for the dynamic analysis of tall buildings subjected to wind loads. [03] 

OR 

2. The plan of a thirty storied building is shown in Fig. 1. The column positions are marked in the figure. The building has to serve as community structure in Zone-IV. Using gust factor method of IS:875(Part-III), calculate the wind forces at 3m, 18m, 27m, 48m, 60m, 75m and 90m above the ground level in an intermediate frame of the building marked by section 1-1. [15] 

Following data are given:
Height of each story = 3 m
Total height of the building = 90 m
Terrain category = 3
Mean probable life of the building = 100 years
Value of the power law coefficient = 0.16

Fig. 1

Contd………2
3. Calculate the horizontal shear at each floor of 12 storey building frame shown in Fig. 2 with the following data. Use the provisions of IS: 1893 (2002) code.

- Thickness of slab: 150 \text{ mm}
- Wall thickness: 225 \text{ mm}
- Beam cross section: 300 \times 400 \text{ mm}
- Column cross section: 300 \times 600 \text{ mm}
- Live load: 3 \text{ kN/m}^2
- Concrete grade: M20
- Steel grade: Fe415

\begin{tabular}{|c|}
\hline
\textbf{3@ 5 m} \\
\hline
\textbf{12@ 3m} \\
\hline
\end{tabular}

\begin{tabular}{|c|}
\hline
\textbf{3@ 4 m} \\
\hline
\textbf{7@ 4 m} \\
\hline
\end{tabular}

\textbf{Plan}

\textbf{Elevation}

\textbf{Fig. 2}

OR

3. A three storey OMRF school building, located in seismic zone V rests on medium stiff soil. The roof and floor loads are 600 \text{ kN} and 700 \text{ kN} respectively. Determine the design seismic forces for the building using dynamic analysis and show the distribution of lateral forces with building height using the free vibration properties of the building as given below. The building is symmetrical in the x and y direction and its properties in both the directions are same. Use the provisions of IS: 1893 (2002) code.

<table>
<thead>
<tr>
<th>Floor</th>
<th>Mode I 0.0647</th>
<th>Mode II 0.023</th>
<th>Mode III 0.016</th>
</tr>
</thead>
<tbody>
<tr>
<td>3\textsuperscript{rd} floor</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>2\textsuperscript{nd} floor</td>
<td>0.802</td>
<td>-0.555</td>
<td>-2.247</td>
</tr>
<tr>
<td>1\textsuperscript{st} floor</td>
<td>0.445</td>
<td>-1.246</td>
<td>1.8018</td>
</tr>
</tbody>
</table>

Contd......3
The plan of the building having four shear walls is shown in Fig. 3. All the four walls are of M25 grade concrete and 250 mm in thickness. Determine the design lateral forces on different shear walls, if the storey height is given 4.5 m and the seismic force on the building is 250 kN in either direction.
2012-13
M.TECH. II SEMESTER EXAMINATION
CIVIL ENGINEERING
(HYDRAULICS STRUCTURE)
WATER RESOURCES ENGINEERING
CE-662

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer any four questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No. Question M.M.
1(a) Write a note on urgent need of water resources development in India [08]
1(b) Discuss various aspects of the problem of ‘inter-linking of rivers in India’ [07]
2 Two alternative plans are considered for a section of an aqueduct. Plan A uses a tunnel: plan B uses a section of a lined canal and a section of steel flume. In plan A, the estimated first cost of the tunnel is $500,000, its estimated annual maintenance is $4000, and its estimated life is 100 years. Estimated first costs and lives for the elements of Plan B are canal (not included lining), $125,000, 100 yr.; canal lining, $50,000, 20 yr.; flume, $90,000, 50 yr.
The annual maintenance cost is $10,500. The interest rate to be used in the economy study is 6% per annum. The study period is 100 yr. All salvage values are assumed to be negligible. Compare the equivalent annual costs for both the plans. [15]
3(a) Write a note on ‘Environmental consequences of water-resources projects.’ [08]
3(b) What do you understand by ‘Multi-purpose Projects’? Discuss the functional requirements and their compatibility in Multiple purpose projects. [07]
4(a) Five alternative projects are under consideration. The estimated annual benefits and costs of the project are tabulated as below. Which of these projects would you select? Give reason also. [10]

Contd........2
<table>
<thead>
<tr>
<th>Project</th>
<th>Annual Benefits ($)</th>
<th>Annual Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1,50,000</td>
<td>1,28,104</td>
</tr>
<tr>
<td>II</td>
<td>2,10,000</td>
<td>1,56,048</td>
</tr>
<tr>
<td>III</td>
<td>2,75,000</td>
<td>2,08,064</td>
</tr>
<tr>
<td>IV</td>
<td>3,00,000</td>
<td>2,84,152</td>
</tr>
<tr>
<td>V</td>
<td>3,40,000</td>
<td>3,36,158</td>
</tr>
</tbody>
</table>

4(b) Explain 'Commonly accepted measures' for reducing flood damage.

5 Discuss the use of a linear programming-optimization-model for a multi purpose water resources project with a simple example.

6(a) Discuss 'Water Resources Project Formulation.'

6(b) What do you mean by Flood Bypass? Water flows at the rate of 210 m$^3$/s in a river (n=0.045) whose flow cross-section can be approximated as a rectangle 70 m wide and 4 m deep. If a flood bypass could be made available to divert 70 m$^3$/s of 210 m$^3$/s, what would be the maximum drop in the stage downstream of the bypass diversion? Assume constant river width, bed slope, and Manning's 'n'.
**2012-2013**  
**M. TECH. (WINTER SEMESTER) EXAMINATION**  
**CIVIL ENGINEERING**  
**INSTRUMENTAL METHODS FOR ENVIRONMENTAL ANALYSIS**  
**CE-683**

Maximum Marks : 60  
Duration: Three Hours

**Answer all the questions.**  
Assume any data judiciously, if required  
Notations used have their usual meaning.

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Explain the difference between ppm in air pollution and ppm in water pollution.</td>
<td>[7.5]</td>
</tr>
<tr>
<td>1(b)</td>
<td>Give a list of water quality parameters that must be measured immediately in the field while sample is being taken. OR</td>
<td>[7.5]</td>
</tr>
<tr>
<td>1(b')</td>
<td>Describe in what cases the use of median can be preferred over that of mean in environmental data processing?</td>
<td>[7.5]</td>
</tr>
<tr>
<td>2(a)</td>
<td>Name the common organic pollutants and their properties. Also draw the structure of most common organic pollutants.</td>
<td>[7.5]</td>
</tr>
<tr>
<td>2(b)</td>
<td>What oven temperature is used to dry samples for suspended solid measurement? Why this constant temperature is important? Why different temperatures of 103° C, 180° C and 550° C are used in solid measurement? OR</td>
<td>[7.5]</td>
</tr>
<tr>
<td>2(b')</td>
<td>Explain the difference in light source used in atomic absorption and the light source used in UV-VIS spectrophotometer.</td>
<td>[7.5]</td>
</tr>
<tr>
<td>3(a)</td>
<td>Discuss the nebulization and atomization process. Why higher sensitivity is achieved in flameless graphite furnace atomic absorption (GF AA) than flame FAA? OR</td>
<td>[7.5]</td>
</tr>
<tr>
<td>3(a')</td>
<td>Sketch and briefly describe the atomic absorption spectrometric technique for the analysis of Cr and Cu. What are the operational parameters that affect the sensitivity?</td>
<td>[7.5]</td>
</tr>
<tr>
<td>3(b)</td>
<td>Draw line diagram of a GC and discuss its important components.</td>
<td>[7.5]</td>
</tr>
<tr>
<td>4(a)</td>
<td>Compare major GC detectors used for environmental trace analysis together with applications.</td>
<td>[7.5]</td>
</tr>
<tr>
<td>4(b)</td>
<td>Discuss the difference between packed columns and capillary columns regarding their performance in separation. OR</td>
<td>[7.5]</td>
</tr>
<tr>
<td>4(b')</td>
<td>What are the major similarities and difference between the mass spectrophotometers used in atomic mass spectrometry and those used in molecular mass spectrometry?</td>
<td>[7.5]</td>
</tr>
</tbody>
</table>
2012-13
M.TECH. (WINTER SEMESTER) EXAMINATION
CIVIL (ENVIRONMENTAL/HYDRAULICS)
SOLID AND HAZARDOUS WASTE MANAGEMENT
CE-685

Maximum Marks: 60  
Credits: 04  
Duration: Three Hours

Answer all the questions. 
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.  Question  M.M.
1(a)  What are the different properties of solid waste on which its composition is characterized? [06]
1(b)  What is integrated solid waste management? [06]
2(a)  What are the recommendations of Heuristic Routing of Solid Waste Collection report? [06]
2(b)  Discuss the cost curve for direct haul system and cost curve for transport when transfer station is included. [06]

OR

2’(b)  Differentiate between Hauled Container System and Stationary Container System. [06]
3(a)  Describe the vertical gravity trash chute system for collection of solid waste in high rise buildings. [06]
3(b)  What is the role of thermophilic and mesophilic microorganisms in composting process? What is the cause of temperature variation during the composting process? [06]
4(a)  What are the different criteria involved in developing a new landfill? Draw a typical layout of a landfill showing elements involved in the implementation of new landfill. [06]
4(b)  What are the different biological processes used for treatment of leachate? [06]

OR

4’(b)  What are different landfill gases compositions during decomposition of solid waste? [06]
What is the methanogenesis stage during biodegradation of solid waste?
5(a)  What is Refuse Derived Fuel (RDF)? Explain briefly about the process to obtain RDF? [06]

OR

5’(a)  How hazardous waste is classified? Describe the deep well injection system for hazardous waste. [06]
5(b)  Discuss the recycling process for any two of the following materials [06]
i) Paper and Cardboard    ii) Plastics    iii) Glass containers
2012-2013
M. TECH. (WINTER SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
ENVIRONMENTAL POLICIES AND IMPACT ANALYSIS
(CE-686)

Maximum Marks : 60
Duration: Three Hours

Answer all the questions.
Assume any data judiciously, if required
Notations used have their usual meaning.

Q.No. | Question                                                                                                                                                                                                 | Marks |
------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
1(a)  | Briefly describe the various examples of socioeconomic factors and their potential changes resulting from project implementation.                                                                          | [8]   |
1(b)  | Sketch the curves that show the deoxygenation, reaeration and DO sag in a river. Show the effect of change in the deoxygenation or reaeration rate on the location of the critical point and the magnitude of DO deficit. | [7]   |
1(b') | Prepare a suitable checklist for data collection in the case of EIA for a flyover construction in a busy city road junction.                                                                            | [7]   |
2(a)  | Write the objectives of international organization for standardization (ISO).                                                                                                                              | [7.5] |
2(b)  | Explain conservation and sustainable development.                                                                                                                                                           | [7.5] |
2(b') | What do you mean by environmental audit? Discuss the various aspects of audit procedure.                                                                                                                   | [7.5] |
3(a)  | What is mathematical modeling? Describe the concept of mathematical modeling applied to air pollution.                                                                                                      | [05]  |
3(b)  | Sulfur dioxide is emitted at the rate of 175 g/s from a stack with an effective height of 65 m. The wind speed at stack height is 6.3 m/s, and the atmospheric stability class is D for the overcast day. Determine the ground level concentration along the center line at a distance of 500 m from the stack, in micrograms per cubic meter. | [10]  |

Contd.......2
3(b)' For the given data in the above question determine the concentration crosswind at 55 m from the center line for the downwind distance of 500 m.

4(a) Discuss the sources of errors in Gaussian Model. Describe the advantages and disadvantages of Gaussian models.

OR

4(a)' Write the basic Gaussian plume model with its usual notations and show variable plume model through diagram.

4(b) Estimate the total hydrocarbon concentration at a point 300 m downwind from an expressway at 4:30 P.M. on an overcast day. The wind is perpendicular to the highway and has a speed of 4.4 m/s. The traffic density along the highway is 8700 vehicles per hour, and the average vehicle speed is 4000 mi/hr. The average vehicle emission rate of hydrocarbon is $2 \times 10^{-2}$ g/s.

[Figure Enclosed]

Contd.....3


Table 4.1  KEY TO STABILITY CATEGORIES

<table>
<thead>
<tr>
<th>SURFACE WIND SPEED AT 10 m (m/s)</th>
<th>DAY</th>
<th>NIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STRONG</td>
<td>MODERATE</td>
</tr>
<tr>
<td>CLASS$^*$</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>&lt; 2</td>
<td>A</td>
<td>A-B</td>
</tr>
<tr>
<td>2-3</td>
<td>A-B</td>
<td>B</td>
</tr>
<tr>
<td>3-5</td>
<td>B</td>
<td>B-C</td>
</tr>
<tr>
<td>5-6</td>
<td>C</td>
<td>C-D</td>
</tr>
<tr>
<td>&gt; 6</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>


*The neutral class, D, should be assumed for overcast conditions during day or night. Class A is the most unstable and class F is the most stable, with class B moderately unstable and class E slightly stable.