Civil Engineering

Paper -II

Time allowed : Three hours Maximum Marks: 300

Note: Attempt Five questions. Minimum two questions to be answered from each part; however question number 2 and 6 are compulsory.

PART - A

1. a. State various characteristics of good timbers and describe various uses of timber. [30]
   b. State properties of good bricks and describe various tests for bricks. [30]

2. What is the cost owning and operating a construction equipment? How will you determine the hourly cost of construction equipment? [60]

3. What are the various methods of tacheometry? Explain in brief. [60]

4. Write detail Comparison between Rigid and Flexible Pavements? [60]

PART-B

5. a. Explain the methods of obtaining average rainfall over a catchment. Write their merits and demerits. [20]
   b. The following are the ordinals of the flood hydrograph from a catchment area of 780 sq km due to 6h storm. Drive the 12 h unit hydrograph. [20]

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>6</th>
<th>12</th>
<th>18</th>
<th>24</th>
<th>30</th>
<th>36</th>
<th>42</th>
<th>48</th>
<th>54</th>
<th>60</th>
<th>66</th>
<th>72</th>
<th>78</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge</td>
<td>40</td>
<td>64</td>
<td>215</td>
<td>360</td>
<td>405</td>
<td>350</td>
<td>270</td>
<td>205</td>
<td>145</td>
<td>100</td>
<td>70</td>
<td>50</td>
<td>40</td>
</tr>
</tbody>
</table>

c. What is channel routing? Develop the channel routing equation [20]

P.T.O.
6. a. Explain how to access the storage capacity of a reservoir. Use appropriate diagram. [20]

b. Design an irrigation unlined canal with the following data Q=60 m³/s, d50 = 1 mm. Draw the section of designed canal. [20]

c. A gravity dam is shown below consider (1) hydrostatic force (2) self weight (3) full uplift [20]

![Diagram of dam](image)

7. Define BOD and how it is determined? [60]

8. Why the analysis of sewage is necessary? Describe the method of collecting sample of sewage. [60]
Civil Engineering

Paper -I

Time allowed : Three hours

Maximum Marks: 300

Note: Attempt Five questions. Minimum two questions to be answered from each part; however question number 2 and 6 are compulsory.

PART - A

1. Define second moment of inertia and find out the Centroidal moment of inertia of a circular section with general notation. [60]

2. A three hinged parabolic arch of 20 m span and 4 m central rise carries a point load of 4 kN at a 4 m horizontally from left hand hinge. Calculate the normal thrust and shear force at the section under the load. Also, calculate the maximum B.M. positive and negative. [60]

3. a. Differentiate between Riveted connection and Welded connection. [30]

   b. Define plastic theory in steel connections. [30]

4. Design a doglegged stair comprising a straight flight of steps, supported between two stringers beams along the two sides. Assume an effective span 1.5m; a rise of 150 mm and a tread of 270 mm. Assume a live load of 3kN/m². Use M20 concrete and Fe 415 steel and mild exposure conditions. [60]

P.T.O.
PART-B

5. A sluice gate 2m X 1.5 m is immersed water as shown below. Determine the total water force and its point of application. Take specific weight of water as 9.810 N/m$^3$. [60]

![Diagram of sluice gate with dimensions and water level](image)

6. Develop the expression of $Y_2/Y_1$ for hydraulic jump over horizontal channel. [60]

7. A natural soil deposit has a bulk unit weight of 18 kN/m$^3$ and water content of 5 percent. Calculate the amount of water required to be added to 1 cubic meter of soil to rise the water content 15 percent. Assume that the void ratio to remain constant. What will then be the degree of saturation? Take $G = 2.7$ [60]

8. The consistency limits of a soil samples are: Liquid Limit 52%, Plastic Limit 32%, Shrinkage Limit 17%, if the specimen of soil shrinks from a volume as 10 cm$^3$ at the liquid limit to 6.01 cm$^3$ at the shrinkage limit, calculate the specific gravity of solids. [60]