MANIPAL INSTITUTE OF TECHNOLOGY

FOURTH SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATION, MAY 2024

WATER RESOURCES ENGINEERING (CIE 2225)

(07– 05 - 2024)

TIME: 3 HRS. **MAX. MARKS: 50**

Note: 1. Answer all questions.
2. Any missing data may be suitably assumed.

<table>
<tr><th>Q. NO</th><th>QUESTION</th><th>MARKS</th><th>CO</th><th>BL</th></tr>
<tr><td>1A (1)</td><td>With a neat sketch illustrate the working principle of the Class A Evaporation Pan</td><td>3</td><td>1</td><td>2</td></tr>
<tr><td>1B (2)</td><td>The Mass curve of the rainfall in a storm of 270 minutes is given below. Draw the hyetograph of the storm for 30 minutes duration. Compute the total rainfall, maximum rainfall intensity and total duration.
<table>
<tr><td>Time since the start in min.</td><td>0</td><td>30</td><td>60</td><td>90</td><td>120</td><td>150</td><td>180</td><td>210</td><td>240</td><td>270</td></tr>
<tr><td>Cumulative Rainfall (mm)</td><td>0</td><td>6</td><td>18</td><td>21</td><td>36</td><td>43</td><td>49</td><td>52</td><td>53</td><td>54</td></tr>
</table></td><td>3</td><td>1</td><td>4</td></tr>
<tr><td>1C (3)</td><td>Explain the circumstance under which a side channel spillway is preferred. Illustrate the working principle of side channel spillway with a sketch.</td><td>4</td><td>4</td><td>3</td></tr>
<tr><td>2A (4)</td><td>Explain in detail the construction and working principle of Tipping Bucket Rain gauge with a neat sketch. How this raingauge differs from the weighing bucket rain gauge? Explain.</td><td>5</td><td>1</td><td>3</td></tr>
<tr><td>2B (5)</td><td>Discuss the uses of flow mass curve. Enumerate the differences between flow duration curve and flow mass curve.</td><td>3</td><td>2</td><td>2</td></tr>
<tr><td>2C (6)</td><td>Illustrate the various structural methods of flood control measures.</td><td>2</td><td>3</td><td>2</td></tr>
<tr><td>3A (7)</td><td>A small watershed consists of 2sq.km of cultivated area (C = 0.2); 2.5sq.km of forest area (C = 0.1); 1.5sq.km of grass cover area (C = 0.35). If the average intensity of a 120-minute rainfall over this watershed is 20.4 mm/h,
Find a) the depth of runoff b) its volume c) maximum possible peak discharge at the outlet of the watershed d) Design flood by taking a FOS= 2.5.</td><td>5</td><td>3</td><td>4</td></tr>
<tr><td>3B (8)</td><td>Distinguish between: (a) Base flow and Interflow; (b) Direct runoff hydrograph and Unit hydrograph; (c) Maximum Probable Flood and Standard Project Flood.</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>3C (9)</td><td>Illustrate any 4 essential requirements of a spillway.</td><td>2</td><td>4</td><td>3</td></tr>
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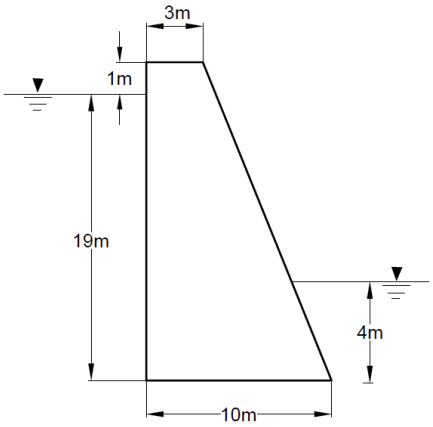
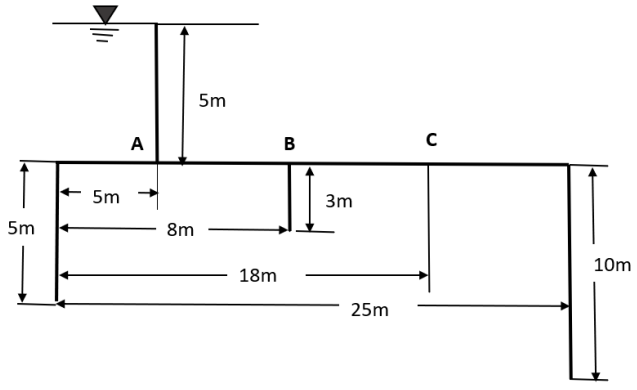
4A (10)	A concrete gravity dam of trapezoidal cross section is shown in figure. If the depth of water on the u/s side is 19 m and on the d/s side is 4 m, find the magnitude of primary forces acting on the dam and show their location in a neat sketch. Take uplift intensity factor as 0.85 and uplift area factor as 90%. Unit weight of concrete = 24 kN/m^3. Specific weight of water = 9.81kN/m^3. 	5	4	4
4B (11)	Explain the purposes of the following structures in a dam. a) Energy dissipator b) Sluices in dams c) Spillways	3	4	2
4C (12)	With suitable reasons discuss any 4 purposes of canal masonry works.	2	5	3
5A (13)	Highlight the circumstance under which Arch Dams are preferred. Why?	2	4	2
5B (14)	Explain in detail any 3 distinguishing characteristics between weirs and barrages.	3	5	3
5C (15)	The figure shows the section of a barrage founded on sand. Calculate the average hydraulic gradient. There is an intermediate sheet pile of 3m at a distance of 8m from the left end. Calculate uplift pressures below the foundation and the floor thicknesses at points, 5m, 8m, 18m from the upstream end of the floor. Assume specific gravity=2.4 and factor of safety = 4/3. Draw the c/s of the weir giving details of the solid apron design at all the relevant parts. 	5	5	4