MANIPAL INSTITUTE OF TECHNOLOGY

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MANIPAL INSTITUTE OF TECHNOLOGY

FOURTH SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATION, MAY 2023

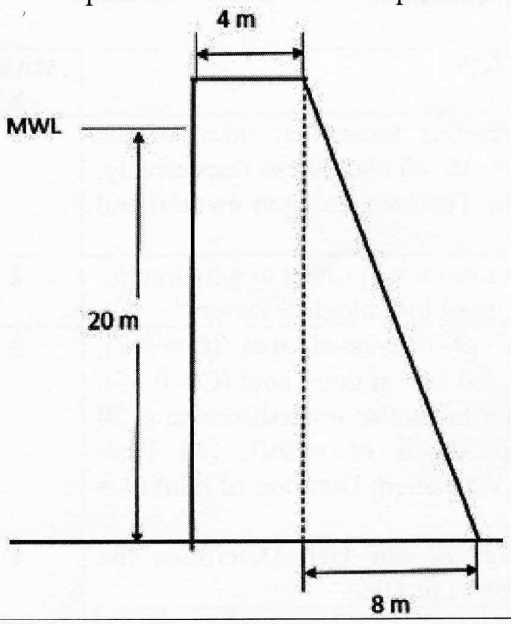
WATER RESOURCES ENGINEERING (CIE 2255)

(xx– xx - 2023)

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</td><td>The rainfall values recorded by stations located at three of the successive corners of a square are 30, 35, 40 and 20 cm respectively. Determine the average rainfall by the Theissen Polygon method and compare it with simple average.</td><td>3</td><td>1</td><td>4</td></tr>
<tr><td>1B</td><td>Justify the statement “Failure of water resource project or a hydraulic structure is due to improper assessment of hydrological factors”</td><td>2</td><td>1</td><td>3</td></tr>
<tr><td>1C</td><td>A small watershed consists of 2 km^2 of cultivated area (C = 0.2), 3.5 km^2 of forest land (C = 0.1), and, 2.0 km^2 of grass land (C = 0.35). If the average intensity of rainfall over the entire watershed area is 20 mm/h, Calculate: (i) The average depth of runoff; (ii) Peak Discharge; and, (iii) Yield from the watershed. Duration of rainfall = 150 min.</td><td>5</td><td>2</td><td>4</td></tr>
<tr><td>2A</td><td>The table below gives the ordinates of 4hr UH. Determine the ordinates of 12hr UH. Plot the 4hr and 12 hr UH.
<table>
<tr><td>Time (hr)</td><td>0</td><td>4</td><td>8</td><td>12</td><td>16</td><td>20</td><td>24</td><td>28</td><td>32</td><td>36</td><td>40</td></tr>
<tr><td>4-hr UHO (cumec)</td><td>0</td><td>36</td><td>90</td><td>93</td><td>68</td><td>49</td><td>34</td><td>23</td><td>13</td><td>6</td><td>0</td></tr>
</table></td><td>4</td><td>3</td><td>4</td></tr>
<tr><td>2B</td><td>Determine the design flood discharge allowing an increase of 35 % over the estimated flood peak for a bridge site having the following data
Catchment area - 500km^2
Observed Max. storm precipitation-15mm for 400 min duration
Time of Concentration - 3 hr
Gauged discharge during the past flood was 9 $\times 10^4$ m^3/min for</td><td>4</td><td>3</td><td>4</td></tr>
</table>

	an average max. daily rainfall of 30 cm.			
2C	List the uses of Flow-Duration Curves	**2**	**3**	**3**
3A	List the advantages of dam? Explain briefly on the major forces acting on gravity dam.	**4**	**4**	**3**
3B	What are the essential requirements that the spillways should satisfy to ensure the safety of the dam. List the types of spillways?	**3**	**4**	**3**
3C	Discuss the circumstances where i. arch dam is preferred over gravity dam. ii. arch dam is not preferred over gravity dam.	**3**	**4**	**3**
4A	Test the stability of the 22m high gravity dam section, shown in figure for overturning, sliding and development of tension. Given: • Specific weight of concrete = 23.5 kN/m^3 • Co-efficient of friction = 0.7 • Uplift area factor = 1 and uplift intensity factor is 0.65.  	**5**	**4**	**4**
4B	Explain the purpose of providing the following masonry works across irrigation canals i. Canal Drops ii. Canal Regulators	**2**	**5**	**3**
4C	What is diversion head work? Sketch the layout and enumerate the component parts	**3**	**5**	**3**
5A	Compare the structure and features of a barrage with that of a weir.	**2**	**5**	**3**
5B	Discuss the causes of failure of weir on a permeable foundation due to sub-surface flow. Also suggest suitable methods of preventing it.	**4**	**5**	**3**
5C	The figure shows the section of a weir founded on sand. Calculate the average hydraulic gradient. Calculate uplift pressures below the foundation specifying the floor thicknesses at points 5, 10 and 15m	**4**	**5**	**4**

	from the upstream end of the floor. Assume specific gravity=2.4 and factor of safety = 4/3.