Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (CIVIL) END SEMESTER EXAMINATIONS

APRIL/MAY 2019

SUBJECT: WATER RESOURCES ENGINEERING (CIE 2201)

Date of Exam: **24/04/2018** Time of Exam: **2:00 PM to 5.00 PM** Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data may be suitably assumed

<table>
<tr><th>Q.No</th><th>Questions</th><th>Marks</th><th>CO</th></tr>
<tr><td>1A</td><td>Distinguish between Isohyetal method and Thiessen polygon method to find out average rainfall over a catchment.</td><td>03</td><td>CO1</td></tr>
<tr><td>1B</td><td>What is the relative significance of Ø- index and W- index? The following details refer to an isolated storm in a 500ha watershed. If the direct runoff by the storm measured at the outlet is 0.340Mm^{3,} estimate Ø- index of the storm, distribution of excess rainfall, its duration and volume of water infiltrated.
<table>
<tr><td>Time from the start (hr)</td><td>0</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td><td>12</td><td>14</td><td>16</td><td>18</td></tr>
<tr><td>Mass curve ordinates (cm)</td><td>0</td><td>0.8</td><td>2.6</td><td>2.8</td><td>4.1</td><td>7.3</td><td>10.8</td><td>11.8</td><td>12.4</td><td>12.6</td></tr>
</table></td><td>04</td><td>CO1</td></tr>
<tr><td>1C</td><td>Sketch a typical infiltration curve and explain any four factors affecting infiltration. Explain each.</td><td>03</td><td>CO1</td></tr>
<tr><td>2A</td><td>With neat sketch, describe any three commonly adopted river training works.</td><td>03</td><td>CO2</td></tr>
<tr><td>2B</td><td>The catchment area of a major tributary of a river consists of 1500ha of cultivated area (C= 0.25), 2000ha of forest land (C=0.1) and 750ha of pasture land (C= 0.4). During a storm of 90min duration the average depth of rainfall over each of these areas was observed to be 10.5cm, 22.3cm and 11.5cm.
Find i) the average depth of runoff ii) peak discharge iii) Yield from the tributary of the river.</td><td>03</td><td>CO2</td></tr>
<tr><td>2C</td><td>Derive the ordinates of 6hr unit hydrograph and determine the area of catchment. The direct runoff hydrograph resulting from a 4cm of effective rainfall of 6hr duration is given below. Also find out the ordinates of storm hydrograph, if the base flow is increasing linearly till 30 hr starting from 5cumec to 30 cumec and remains constant thereafter. Plot the 6hr unit hydrograph and storm hydrograph on graph sheet.
<table>
<tr><td>Time(hr)</td><td>0</td><td>6</td><td>12</td><td>18</td><td>24</td><td>30</td><td>36</td><td>42</td><td>48</td><td>54</td><td>60</td></tr>
<tr><td>Direct Runoff (cumec)</td><td>0</td><td>25</td><td>120</td><td>310</td><td>380</td><td>300</td><td>250</td><td>172</td><td>100</td><td>30</td><td>0</td></tr>
</table></td><td>04</td><td>CO2</td></tr>
<tr><td>3A</td><td>List the Ill-Effects of Irrigation and discuss each of them briefly. (4 points)</td><td>02</td><td>CO3</td></tr>
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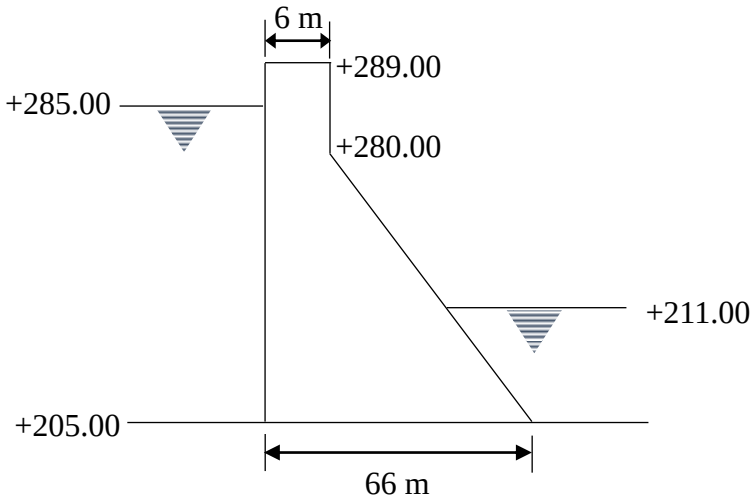
<table>
<tr><td>3B</td><td>Compute the depth and frequency of irrigation. Given following data: Root zone depth = 100cm, field capacity =22%, wilting coefficient = 12%, dry density of soil = 1.5 gm/cc, average daily consumptive use =25mm. Assume that readily available moisture content is 70% of available moisture content. If the discharge available at the outlet of canal system is 48lps, find the area that can be irrigated each day in 8hours. Take water conveyance efficiency of field channel as 70%; water application efficiency as 50%.</td><td>03</td><td>CO3</td></tr>
<tr><td>3C</td><td>Explain the various causes of failure of weirs on permeable foundation along with the remedial measures</td><td>05</td><td>CO5</td></tr>
<tr><td>4A</td><td>Check the stability of the given gravity dam section against
(i) Overturning (ii) Sliding (iii) Tension
Take, coefficient of friction as 0.80
Permissible shear strength at the base of the dam as 1400kN/m^2
Unit weight of dam material 25 kN/m^3
 
</td><td>06</td><td>CO4</td></tr>
<tr><td>4B</td><td>Explain with neat sketches the various types of embankment dams.</td><td>04</td><td>CO4</td></tr>
<tr><td>5A</td><td>While fixing the alignment of an irrigation canal it was observed the canal needs to cross different natural drains at 4 sections. Following data are available at the point of crossing.
<table>
<tr><th rowspan="2">Section</th><th colspan="3">Canal</th><th colspan="3">Natural Drain</th></tr>
<tr><th>RL of bed (m)</th><th>FSL (m)</th><th>Discharge (m^3/sec)</th><th>RL of bed (m)</th><th>HFL (m)</th><th>Discharge (m^3/sec)</th></tr>
<tr><td>A</td><td>180.0</td><td>182.0</td><td>2.0</td><td>198.2</td><td>201.7</td><td>400.0</td></tr>
<tr><td>B</td><td>210.0</td><td>211.5</td><td>2.5</td><td>200.0</td><td>203.8</td><td>580.0</td></tr>
<tr><td>C</td><td>157.0</td><td>159.3</td><td>2.8</td><td>155.2</td><td>158.9</td><td>450.0</td></tr>
<tr><td>D</td><td>182.5</td><td>183.8</td><td>2.4</td><td>182.3</td><td>183.8</td><td>110.0</td></tr>
</table>
Identify the cross drainage work that you would recommend for each of these sections. Explain with a neat sketch the cross drainage work used at Section B</td><td>04</td><td>CO5</td></tr>
<tr><td>5B</td><td>A vertical drop weir has the following particulars:
Length of weir = 50 m, Height of weir = 2.5 m, Top Width = 2.0 m, Base width = 4.0 m, Height of Shutter = 0.80 m, Nature of bed: Coarse Sand with Bligh’s Coefficient = 12, Sp. Gr. of floor material = 2.24
1. Design the length and thickness of solid apron for the weir
2. Draw the C/S of the weir giving details of the same
Assume the length of U/S and D/S cut-offs as 2 m and 2.5 m respectively</td><td>06</td><td>CO5</td></tr>
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