



# Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



### V SEMESTER B.TECH (CIVIL ENGINEERING)

## **END SEMESTER EXAMINATIONS, NOV/DEC 2015**

# SUBJECT: WATER RESOUCES ENGINEERING [CIE 305]

### **REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

- ✤ Answer ANY FIVE FULL the questions.
- ✤ Missing data may be suitably assumed.

| 1 <b>A</b> . | State and explain the classification of precipitation based on its formation  |  |         |            |            |         |          |      |        | (3)     |       |            |  |  |
|--------------|---|--|---------|------------|------------|---------|----------|------|--------|---------|-------|------------|--|--|
| 1R           | Explain briefly Theisson Polygon and Isohyetal methods of averaging the rainfall  |  |         |            |            |         |          |      |        |         | (4)   |            |  |  |
| 10.          | depth over a catch  | iment.   |         |            |            |         |          |      |        |         |       | 、 <i>/</i> |  |  |
|              | The following details refer to an isolated storm in a 500 ha watershed. If the direct   |  |         |            |            |         |          |      |        |         |       |            |  |  |
|              | runoff by the storm measured at the outlet is 0.340 $\text{Mm}^3$ , estimate the $\Phi$ index of the  |  |         |            |            |         |          |      |        |         | (2)   |            |  |  |
| 1C.          | storm and duration of the excess rainfall.  |  |         |            |            |         |          |      |        |         | (3)   |            |  |  |
|              | Time from the start(  | (h) 0  | 2       | 4 6        | 8          | 10 1    | 2 1      | 4    | 16     | 18      |       |            |  |  |
|              | Cumulative rainfall   | (cm) 0   | 0.8     | 2.6 2.     | 8 4.1      | 7.3 1   | 0.8 1    | 1.8  | 12.4   | 12.6    |       |            |  |  |
| 24           | Define the terms: (i) Pan Coefficient; (ii) Consumptive-use Coefficient;  |  |         |            |            |         |          |      |        |         |       | (2)        |  |  |
| <b>ZA</b> .  | (iii) Flow Mass Curve (iv) Potential Evapo_Transpiration  |  |         |            |            |         |          |      |        |         | (-)   |            |  |  |
| 2B.          | Explain the runoff process with a neat schematic sketch.  |  |         |            |            |         |          |      |        |         | (4)   |            |  |  |
|              | The following table shows the shows of source located in the state of |  |         |            |            |         |          |      |        |         |       |            |  |  |
|              | The following tab   | actahmar                                       |         | serveu a   | iniual fai | inan ai | iu the c | ones | spond  | ing am  | iuai  | (4)        |  |  |
|              | runoii ior a sinali catchment.  |  |         |            |            |         |          |      |        |         | ( )   |            |  |  |
|              | Painfall (and)  | 2004   | 2005    | 2000       | 2007       | 2008    | 2009     | 20   | 76     | 2011    | _     |            |  |  |
|              | Rainiali (Cffi)   | 90.5   | 50.2    | 5 2        | 129.5      | 145.5   | 99.8     | 14   | -7.0   | 50.9    | _     |            |  |  |
| 20.          | Kulloff (CIII)  | non (cm) 50.1 50.2 5.5 01.5 /4.8 59.9 04.7 0.5 |         |            |            |         |          |      |        |         |       |            |  |  |
|              | Deviation the mainfall manoff completion equation for this established the  |  |         |            |            |         |          |      |        |         |       |            |  |  |
|              | Develop the familian-runoff correlation equation for this calchinent, find the  |  |         |            |            |         |          |      |        |         |       |            |  |  |
|              | correlation coefficient and comment on the result. What annual runoff can be  |  |         |            |            |         |          |      |        |         |       |            |  |  |
|              | Distinguish haters  | s catchille                                    |         | ui aiiiiua | u i annan  | 01 100  |          |      |        |         |       |            |  |  |
| 3A.          | Distinguish betwe   | (1) Ba   | ise now |            | ernow;     |         |          |      | 1.     |         |       | (2)        |  |  |
|              | (ii) Direct runoff hydrograph and Unit hydrograph   |  |         |            |            |         |          |      |        |         |       | ( 1 )      |  |  |
| 3B.          | Write a brief note  | on stream                                      | n gaugi | ng by ar   | ea-veloc   | ity met | hod wit  | h ne | cessar | y sketc | ch.   | (4)        |  |  |
| 20           | List any TWO: (i) Major River Training Works; (ii) Structural methods of Flood  |  |         |            |            |         |          |      |        |         | (4)   |            |  |  |
| <b>3</b> 6.  | Control., Describe them briefly in Two/Three sentences.   |  |         |            |            |         |          |      |        |         | ( ')  |            |  |  |
| 4.6          | Name and define the four allowances required to be made in the estimation of canal  |  |         |            |            |         |          |      |        |         | (2)   |            |  |  |
| 4A.          | design, discharge. State their approximate values.  |  |         |            |            |         |          |      |        |         | (-)   |            |  |  |
| 4B.          | i). Represent the different zones of storage in a reservoir with a neat sketch with   |  |         |            |            |         |          |      |        |         |       |            |  |  |
|              | relevant water level terms and explain each of them.  |  |         |            |            |         |          |      |        |         | (3+2) |            |  |  |
|              | ii). List any two merits and two demerits of irrigation.  |  |         |            |            |         |          |      |        |         |       |            |  |  |

| Reg. No. |  |  |  |  |  |  |  |  |  |  |
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| 4C.     | Paddy is required to be grown in a 3.3 ha filed having a field capacity equal to 29% and permanent wilting point equal to 15%. Find the maximum storage capacity in 100 cm depth of soil, if the dry density of soil is 1.5 gm/cc. If irrigation water is to be supplied when the average moisture falls to 18% and application efficiency is 80%, find the depth and frequency of irrigation. Also, calculate the volume of water required at the outlet of the canal system for each irrigation, if 15% of water discharged at the canal outlet is lost during conveyance. The consumptive use requirement of crop is 3.5 mm/day. | (3) |
| 5A.     | Explain: (i) Spillways & State its different types; (ii) Energy Dissipaters & State its different types.  | (2) |
| 5B.     | List the various modes of failure of gravity dams and state the requirements against those modes of failure.  | (4) |
| 5C.     | Draw a neat sketch of the $C/S$ of a Zoned Earthen Embankment naming all its components. State its any TWO merits and TWO demerits.   | (4) |
| 6A.     | Explain the terms: (i) Diversion Head Works; (ii) Canal Masonry Works; (iii) Cross Drainage Works; (iv) River Training Works.   | (2) |
| 6B.     | Explain the classification of canals based on their alignment and state the merits and demerits of each of them.  | (4) |
| 6C.     | A vertical drop weir has following particulars: Length of weir = 15m; Its Height =3m; Its Top Width = 1.8m; Its Base width = 3.8m; Height of Shutter = 0.75m. Nature of bed: Coarse Sand with Bligh's Coefficient = 15. (a) Design the length and thickness of solid apron for the weir; (b) Draw the $C/S$ of the weir giving details of the solid apron design and showing & naming all the relevant component parts. Assume the length of U/S and $D/S$ cut-offs as 6m and 12m respectively; and take the length of $U/S$ and $D/S$ Bed protections as 10m and 20m, respectively; their thickness 1m.                            | (4) |