

Code No: **R31014**

**R10**

**Set No. 1**

**III B.Tech I Semester Supplementary Examinations, May/June - 2015**

**WATER RESOURCES ENGINEERING-I**

**(Civil Engineering)**

**Time: 3 hours**

**Max. Marks:75**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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- 1 a) What factors you consider in selecting a site for a rain-gauge station? [7]  
b) What are the different forms of precipitation? Which of them are of significance to a civil engineer? [8]
- 2 a) The rates of rainfall for the successive 30 min period of a 3-hour storm are: [7]  
1.6, 3.6, 5.0, 2.8, 2.2, 1.0 cm/hr. The corresponding surface runoff is estimated to be 3.6cm. Establish the  $\phi$ -index. Also determine the W-index.  
b) What is a rainfall hyetograph? How is it derived from a given rainfall mass curve? [8]
- 3 a) Write down the convolution equation and explain its physical interpretation with a neat sketch. [7]  
b) Describe how unit hydrograph can be used to predict the runoff from a storm. What are the uses of unit hydrograph? [8]
- 4 a) Describe the method of estimating a  $T_r$  – year flood using Log-Pearson type III distribution. [7]  
b) Define ‘flood routing’. What are the usual assumptions made in routing a flood in a reservoir? [8]
- 5 a) Derive an expression for the steady state discharge of well fully penetrating into a unconfined aquifer. [7]  
b) List out the assumption made in the analysis of steady radial flow into well. [8]
- 6 a) Describe border strip method of irrigation. Derive the expression for the time required to cover a given area by this method, for a given rate of discharge and the rate of infiltration of water in the soil. [7]  
b) Discuss in brief the benefits and ill-effects of irrigation. [8]
- 7 a) Explain the following irrigation efficiencies: [7]  
i)Water conveyance efficiency ii)Water application efficiency iii)Water use efficiency  
iv)Water storage efficiency v) Water distribution efficiency  
b) A crop requires a total depth of 9.2 cm of water for a base period of 120 days. Find the duty of water. [8]
- 8 a) Explain various types of canals, according to various classification systems. [7]  
b) Give a brief note on “Balancing depth of cutting” [8]

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**Set No. 2**

**III B.Tech I Semester Supplementary Examinations, May/June - 2015**

**WATER RESOURCES ENGINEERING-I**

**(Civil Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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- 1 a) Discuss with a neat sketch various methods used to compute average rainfall over a basin. [7]  
b) List out various practical applications of hydrology. [8]
- 2 a) Explain briefly the infiltration process. What are the factors that influence the process of infiltration? [7]  
b) The hyetograph of a storm of 6 h duration is constructed with a varying time interval: at 20 minutes interval for the first one hour, at 40 minute interval for the next 2 hours and one hour interval for the last 3 hours. The successive ordinates of the hyetograph in mm/h are 66, 75, 54, 48, 69, 51, 38, 47 and 25. Determine the total rainfall depth produced by the storm. [8]
- 3 a) What do you mean by unit hydrograph? Describe the step by step procedure of the derivation of a unit hydrograph from an isolated storm. [7]  
b) Sketch a typical hydrograph resulting from an isolated storm and explain different features of it. [8]
- 4 a) From the historical data of annual flood peaks of a catchment the mean and standard deviation are estimated as 20000 m<sup>3</sup>/sec and 10000 m<sup>3</sup>/sec. An existing structure on this catchment has been designed for 40000 m<sup>3</sup>/sec. What could be its return period? (Assume standard deviation and mean of the reduced extremes which depend on the sample size and taken from Gumble's table are 1.06 and 0.52). [7]  
b) How does 'stream flow routing' differ from reservoir flood routing? [8]
- 5 a) With a neat sketch explain different types of aquifers. [7]  
b) In an area of 110 ha, the water table dropped by 5 m due to continuous ground water pumping. If the porosity of the aquifer soil is 26% and the specific retention is 10%, determine:  
(i) the specific yield of the aquifer,  
(ii) the decrease in the ground water storage. [8]
- 6 a) Compare surface irrigation with sub-surface irrigation. [7]  
b) Describe in detail sprinkler method of irrigation. Indicate the advantages and limitation of this method. [8]

- 7 a) What are the factors affecting duty? How can duty be improved? [7]  
b) Explain various factors affecting consumptive use of water. [8]
- 8 a) Explain Lacey's silt theory [7]  
b) Using Kennedy's theory, design a channel section for the following data: [8]  
Discharge  $Q = 16 \text{ cumecs}$   
Kutter's  $N = 0.0225$   
Critical velocity ratio  $m = 1$   
Side slopes  $= \frac{1}{2} : 1$   
Bed slope  $= 1/6000$ .

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**Set No. 3**

**III B.Tech I Semester Supplementary Examinations, May/June - 2015**

**WATER RESOURCES ENGINEERING-I**

**(Civil Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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- 1 a) Discuss with a neat sketch various types of rain gauges. [7]  
b) Describe the hydrological cycle with a neat sketch. [8]
- 2 a) Discuss the various factors affecting evapotranspiration. [7]  
b) Define  $\phi$ -index and W-index and bring out the difference between them. How is  $\phi$ -index determined from the rainfall hyetograph? [8]
- 3 a) The ordinates of a 3-hr unit hydrograph are given below. Derive the flood hydrograph due to a 3-hr storm, producing a rainfall excess (net rain) of 4 cm. The base flow is estimated to be 4 cumecs and may be assumed constant. [7]

Time (hr)	0	3	6	9	12	15	18	21	24	27
3-hr UH ordinates (cumecs)	0	1.5	4.5	8.6	12.0	9.4	4.6	2.3	0.8	0

- b) Define an 'S-curve hydrograph' giving a neat sketch, and state its use. [8]
- 4 a) Describe the method of estimating a  $T_r$  – year flood using Gumbel's distribution. [7]  
b) Differentiate between channel routing and reservoir routing. [8]
- 5 a) In a certain alluvial basin of 110 km<sup>2</sup>, 100 Mm<sup>3</sup> of ground water was pumped in a year and the ground water table dropped by 4 m during the year. Assuming no replenishment, estimate the specific yield of the aquifer. If the specific retention is 12%, what is the porosity of the soil? [7]  
b) Derive an expression for the steady state discharge of well fully penetrating into a confined aquifer. [8]
- 6 a) Describe in detail the border strip method of irrigation. [7]  
b) Discuss the various sub-surface irrigation methods. Indicate their limitations. [8]

- 7 a) Explain the terms 'duty' and 'delta'. Derive a relationship between the two. [7]  
b) Explain how frequency of irrigation is determined. [8]
- 8 a) Describe Kennedy's silt theory. What are the drawbacks in this theory? [7]  
b) Using Lacey's theory, design an irrigation channel for the following data: [8]  
Discharge  $Q = 60$  cumecs  
Silt factor  $f = 1$   
Side slopes  $= 1/2 : 1$ .

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**Set No. 4**

**III B.Tech I Semester Supplementary Examinations, May/June - 2015**

**WATER RESOURCES ENGINEERING-I**

**(Civil Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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- 1 a) Explain three methods of determining the mean areal depth of precipitation over a basin covered by several rain-gauge stations. [7]  
b) Describe with a neat sketch the principle of working of Simon's non-recording rain gauge. [8]
- 2 a) Differentiate between [7]  
i. Potential evapotranspiration and actual evapotranspiration  
ii. Actual infiltration rate and infiltration capacity  
b) Explain various factors affecting infiltration. [8]
- 3 a) The ordinates of a 12-hour unit hydrograph in cumec are given below. [7]  
Compute 4-hour unit hydrograph ordinates using S-curve technique.  
Time (hr): 0 6 12 18 24 30 36 42 48 54 60 66 72  
12-hr UGO: 0 1 4 8 16 19 15 12 8 5 3 2 1  
b) Explain 'synthetic unit hydrograph'. [8]
- 4 a) Explain clearly the I.S.D. curves method of reservoir flood routing. What are the factors to be considered in choosing the routing period? [7]  
b) Discuss causes for flood and effect of floods. [8]
- 5 a) Determine the diameter of an open well in coarse sand to give an average yield of 220 lpm under a safe working depression head of 2.5 m (Hint: for coarse sand  $C \approx 1 \text{ hr}^{-1}$ ). [7]  
b) Explain various rock properties effecting ground water. [8]
- 6 a) Explain various advantages and disadvantages of drip irrigation? [7]  
b) Explain zig-zag method of irrigation along with a neat sketch. [8]
- 7 a) Discuss in brief the functions of irrigation water. What are the standards of irrigation water? [7]  
b) What are the factors affecting duty? How can duty be improved? [8]
- 8 a) Compare Kennedy's and Lacey's theories for the design of irrigation channel in alluvial soil. [7]  
b) Design an irrigation canal to carry a discharge of 6 cumec. Assume  $N = 0.0225$ ,  $m = 1.0$  and  $(B/D) = 3.24$  [8]

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