

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: 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 ϕ -index. Also determine the W-index. | [7] |
| | 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:
i)Water conveyance efficiency ii)Water application efficiency iii)Water use efficiency
iv)Water storage efficiency v) Water distribution efficiency | [7] |
| | 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] |

Code No: **R31014****R10****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**

- 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 $20000 \text{ m}^3/\text{sec}$ and $10000 \text{ m}^3/\text{sec}$. An existing structure on this catchment has been designed for $40000 \text{ m}^3/\text{sec}$. What could be its return period? (Assume standard deviation and mean of the reduced extremes which depend on the sample size and taken from Gumbel'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]

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- 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 $= 1/2 : 1$
Bed slope $= 1/6000$.

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R10

Set No. 3
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WATER RESOURCES ENGINEERING-I
(Civil Engineering)
Time: 3 hours
Max. Marks: 75
Answer any FIVE Questions
All Questions carry equal marks

- 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 ϕ -index and W-index and bring out the difference between them. How is ϕ -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^2 , 100 Mm^3 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]

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- 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

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(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
i. Potential evapotranspiration and actual evapotranspiration
ii. Actual infiltration rate and infiltration capacity | [7] |
| | b) | Explain various factors affecting infiltration. | [8] |
| 3 | a) | The ordinates of a 12-hour unit hydrograph in cumec are given below.
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 | [7] |
| | 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] |
