

CODE NO: 07A50103

R07

SET - 1

III B.TECH - I SEMESTER EXAMINATIONS - MAY, 2011
WATER RESOURCES ENGINEERING – I
(CIVIL ENGINEERING)

Time: 3hours**Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks

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- 1.a) Explain different types and forms of precipitation in detail.
- b) The annual rainfalls at 7 rain gauge stations in a basin are 58, 94, 60, 45, 20, 88 and 68 cm respectively. What is the percentage accuracy of the existing network in the estimation of average depth of rainfall over the basin? How many additional rain gauges are required if it is desired to limit the error to only 10%.
[8+8]
- 2.a) Define i) Evaporation ii) Transpiration iii) Initial abstractions
iv) Effective Rainfall.
- b) Describe the moving boat method of measuring discharge in large streams.[8+8]
- 3.a) What is a unit Hydrograph? What is the significance of it? Describe assumptions and limitations of unit Hydrograph.
- b) What is an IUH? What are its characteristics? [8+8]
- 4.a) Describe the method of estimating T_r – year flood using Log-pearson type III distribution.
- b) Discuss modified puls method of reservoir routing. [8+8]
- 5.a) Explain
i) Darcy's law and its validity
ii) Types of wells.
- b) Derive an expression for the steady state discharge of a well fully penetrating into a unconfined aquifer. [8+8]
- 6.a) Enumerate and explain the factors which necessitate irrigation.
- b) Explain different methods of improving soil fertility. [8+8]
- 7.a) What do you mean by duty and delta. What are the factors affecting duty. Explain.
- b) The following data pertains to healthy growth of a crop
Field capacity of soil = 30%
Permanent wilting percentage = 11%.
Density of soil = 1300 kg/m^3 .
Effective depth of root zone = 700 mm.
Daily consumptive use of water for the given crop = 12mm for healthy growth, moisture content must not fall below 25% of the water holding capacity between the field capacity and the permanent wilting point. Determine the watering interval in days. [8+8]
- 8.a) Bring out clearly the differences between Kennedy's and Lacey's theory.
- b) List the various types of canal lining. Discuss the salient features of cement concrete lining. [8+8]

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Answer any FIVE questions
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- 1.a) Describe various practical applications of Hydrology.
- b) Explain different methods of computation of average depth of rainfall over a basin. [8+8]
- 2.a) What are the factors affecting infiltration? Explain also describe Hortor's equation.
- b) Describe the factors affecting runoff. [8+8]
- 3.a) What is master depletion curve. How is it used to separate the base flow from total runoff?
- b) Calculate Snyder's synthetic unit hydrograph parameters for the following data. Catchment area = 950 km²; L = 48 km; L_c = 21 km; C_t = 1.65, C_p = 0.57. Adopt standard duration. [8+8]
- 4.a) Define the problem of level pool routing. Describe a commonly used method of reservoir routing.
- b) From the Historical date of annual flood peaks of a Catchment, the mean and standard deviation are estimated are estimated as 20000m³/sec and 10000m³/sec. An existing structure in this catchment has been designed for 40000m³/sec. What could be its return period? Assume Gumbel's extreme value distribution with $\bar{y}_n = 0.52$ and $\sigma_n = 1.06$. [8+8]
- 5.a) Distinguish between
 - i) Aquifer and Aquitard
 - ii) Unconfined and leaky aquifer
 - iii) Influent and effluent streams
 - iv) Water table and piezometric surface.
- b) Derive an expression for the steady state discharge of well fully penetrating into a confined aquifer. [8+8]
- 6.a) Explain the facts affecting the choice of method of irrigation.
- b) Discuss various sub-surface irrigation methods indicate their limitations. [8+8]
- 7.a) Explain
 - i) Vertical distribution of soil moisture and
 - ii) Soil moisture tension.
- b) What is consumptive use of water? Describe any two methods for determining the consumptive use of water. [8+8]
- 8.a) Differentiate between
 - i) Productive and protective canal
 - ii) Permanent and inundation canal.
 - iii) Feeder canal and branch canal
 - iv) Contour and ridge canal.
- b) A channel section is to be designed for the following data.
 Discharge Q = 10 cumecs;
 Silt factor f = 1.0;
 Side slope = $\frac{1}{2} H : 1v$. Design the canal and also find the bend slope. [8+8]

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Time: 3hours**Max. Marks: 80**

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- 1.a) Describe the hydrologic cycle with a neat sketch.
- b) What is the difference between recording and non-recording type rain gauge. Describe siphon type rain gauge with a neat sketch. [8+8]
- 2.a) Explain how separation of base flow is carried out.
- b) Describe how evapo-transpiration is estimated using Blaney criddle method.[8+8]
- 3.a) Explain how can IUH be derived from 'S' curve.
- b) The peak ordinate of a flood hydrograph produced by a 4 hr storm yielding 6.7 cm of rainfall is observed to be $832\text{m}^3/\text{sec}$. If the base flow and ϕ index are $15\text{ m}^3/\text{sec}$ and 0.5 cm/hr . What is the peak ordinate of the 4 hr unit hydrograph.[8+8]
- 4.a) Explain rational method of computing the peak discharge of a small catchment. Where this method commonly used and what are its merits and demerits?
- b) Distinguish between
 - i) Hydrologic and hydraulic Routing
 - ii) Prism and wedge storage
 - iii) Channel and reservoir routing. [8+8]
- 5.a) Explain the role of ground water in water resources development in the country.
- b) Describe radial flow to wells in confined and unconfined aquifers with the help of neat sketches. [8+8]
- 6.a) Give a detailed note on History of development of irrigation in India.
- b) Discuss in detail the standards of quality for irrigation water. [8+8]
- 7.a) Explain the terms
 - i) Saturation capacity
 - ii) Field capacity
 - iii) Moisture equivalent
 - iv) Wilting point
 - v) Readily available moisture.
- b) A loan soil has field capacity of 27% and permanent wilting percentage 12%. The dry weight of the soil is 13.73 kN/m^3 . If the depth of root zone is 1m, determine the storage capacity of the soil. Irrigation water is applied when moisture content drops to 15%. if water application efficiency is 75%, determine the water depth required to the applied in the field. [8+8]
- 8.a) Describe the detailed classification of canals.
- b) What is balancing depth of cutting? Explain with a neat sketch. [8+8]

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- 1.a) Discuss Rainfall
 - i) Intensity – duration
 - ii) Intensity –frequency – duration curves and
 - iii) Depth area duration curves with neat sketches.
- b) Neighboring rain gauge stations A, B, C, D, E and F have normal annual rainfalls of 610, 554, 468, 606, 563 and 382 mm respectively. During a storm, stations B, C, D, E and F have reported rainfalls of 22, 29, 35, 13 and 25 mm respectively and station A did not report as it was inoperative. Estimate the missing storm rainfall at A by arithmetic average method and normal ratio method. [8+8]
- 2.a) Explain with a neat sketch, the method of measuring the velocity at a point in a stream using current meter.
- b) Explain the run-off process with the help of a schematic diagram. [8+8]
- 3.a) Describe ‘S’ curve method of developing 6 hr UH by using 12 hr UH of the catchment.
- b) Discuss the method of deriving unit hydrograph from complex storms. [8+8]
- 4.a) Describe the method of estimating T_r year flood using Gumbel’s method.
- b) Discuss the Muskingum method of channel routing. [8+8]
- 5.a) Explain the terms
 - i) Cone of depression
 - ii) Radius of influence
 - iii) Drawdown
 - iv) Secondary porosity.
- b) A 300 mm diameter well penetrates 25 m below the static water table. After 24 hours of pumping at 6000 lit/min, the water table in a test well at 90 m is lowered by 0.53 m and in a well of 30 m away the drawdown is 1.11 m. What is the transmissibility of the aquifer? [8+8]
- 6.a) Describe in detail sprinkler method of irrigation indicate the advantages and limitations of this method.
- b) Explain the various Indian agricultural soils. [8+8]
- 7.a) Explain how the frequency of irrigation is determined.
- b) Describe various irrigation efficiencies. [8+8]
- 8.a) What is canal lining. What are the requirements of the canal lining? Also discuss the economics of canal lining.
- b) Design an irrigation channel to carry a discharge of 10 cumecs. Assume $N = 0.0225$ and $m = 1$. The channel has a bed slope of 0.3 m per kilometer.[8+8]

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