Code No: V3103/R07 **Set No: 1**

III B.Tech I Semester Regular & Supplementary Examinations, November 2011

WATER RESOURCES ENGINEERING - I

(Civil Engineering)

Time: 3 Hours **Max Marks: 80**

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.
   (b) Describe hydrological cycle briefly (12+4)

2. (a) The following were the monthly evaporation data in cm in certain year (Jan.-Dec.) in the vicinity of a lake:

15.7	14.1	16.9	24.0	27.5	21.4
15.7	16.2	16.2	20.5	15.7	15.4

   The water spread area in the lake in the beginning of January was 3.2 km^2 and at the end of December 2.6 km^2. Calculate the loss of water in million m3 due to evaporation in that year. Assume a pan coefficient of 0.71.
   (b) Distinguish between: (i) Direct runoff and base flow, (ii) Depression storage and detention storage (10+6)

3. (a)Explain how a 2D h unit hydrograph is derived from a D h unit hydrograph.
   (b)Describe the step by step procedure of the derivation of a unit hydrograph from an isolated storm (8+8)

4. (a)Describe the various steps involved in the I.S.D method of reservoir routing.
   (b)From the analysis of available data an annual flood peaks of a small strem for a period of 35 year, the 50 year and 100 year flood have been estimated to be 650 m^3/s and 750 m^3/s using Gumbel's method. Estimate the 200 year flood for the stream. (for n = 35, mean and standard deviation of reduced extremes are 0.54034 and 1.12847 respectively) (8+8)

5. (a)In a certain alluvial basin of 120 km^2, 100 Mm^3 of ground water was pumped in a year and the ground water table dropped by 5 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?
   (b)Derive an expression for the steady state discharge of well fully penetrating into a confined aquifer. (8+8)

6. (a)Describe briefly the necessity and importance of irrigation works in our country.
   (b)What are the different types of irrigation? Write brief notes on each of them.(6+10)

7. (a)Explain the terms ‘duty’ and ‘delta’ of canal water. Derive a relationship between the two.
   (b)A field channel has culturable commanded area of 2000 hectares. The intensity of irrigation for gram is 30 % and for wheat is 50%. Gram has a kor period of 18 days and kor depth of 12 cm, while wheat has a kor period of 15 days and kor depth of 15 cm. Calculate the discharge of the field channel. . (8+8)

8. (a)Design an irrigation canal to carry a discharge of 7 cumecs. Assume N = 0.0225, m = 1.0 and (B/D) = 3.20
   (b)What do you mean by balancing depth of cutting. (8+8)

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Code No: V3103/R07 **Set No: 2**

III B.Tech I Semester Regular & Supplementary Examinations, November 2011

WATER RESOURCES ENGINEERING - I

(Civil Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a)Distinguish between recording and non-recording rain-gauges, giving examples of such gauges used in India.
   (b)What are the different forms of precipitation? Which of them are of significance to a civil engineer? (8+8)

2. (a)Enumerate the various water losses.
   (b)What are the factors, which affect infiltration? Explain any one method of determining the infiltration capacity of a soil surface. (6+10)

3. (a)Describe in detail any one method of deriving unit hydrograph from a complex storms.
   (b)A basin having a drainage area of 2500 km^2 with L = 100 km and L_c = 50 km is a sub-basin of the catchment. Compute a 4 h synthetic unit hydrograph for this sub-basin (Assume C_t = 1.994 C_p= 0.545) (8+8)

4. (a)Derive the Muskingum routing equation and the expression for the routing coefficients C_0, C_1, C_2.
   (b)A coffer dam is designed for a 25 year flood and constructed. If it takes 5 year to complete the construction of main dam, what is the risk that the coffer dam may fail before the end of the construction period? What return period in the design of coffer dam would have reduced the risk to 10%. (8+8)

5. (a) A well penetrates into an unconfined aquifer having a saturated depth of 50 m. The discharge is 250 1pm at 8 m drawdown. What would be the discharge at 10 m drawdown. The radius of influence in both the cases may be taken as same.
   (b)Distinguish between
   (i) Aquifer and Aquifuge
   (ii) darcy velocity and actual velocity
   (iii)Aquiclude and Aquitard
   (iv)Groundwater and perched groundwater (8+8)

6. (a)What is meant by surface and sub-surface irrigation and what are their types?
   (b)Discuss briefly the various techniques used for distributing water in the farms. (6+10)

7. (a)After how many days will you supply water to soil in order to ensure sufficient irrigation of the given crop, if
   (i) Field capacity of the soil = 28 %
   (ii) Permanent wilting point = 13%
   (iii) Density of soil = 1.3 g/cm^3
   (iv) Effective depth of root zone = 70 cm
   (v) Daily consumptive use of water for the given crop = 12 mm.

   (b)Write short notes on:
   (i) Crop rotation (ii) Consumptive use and its estimation,
   (iii) Water distribution efficiency, (iv) Net irrigation requirement (10+6)

8. (a) Describe Lacey's theory for the design of irrigation channel in alluvial soil.
   (b)Design an irrigation channel to carry a discharge of 7 cumecs. Assume N = 0.0225 and m = 1. The channel has a bed slope of 0.25 m per kilometer. (8+8)

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Code No: V3103/R07 **Set No: 3**

III B.Tech I Semester Regular & Supplementary Examinations, November 2011

WATER RESOURCES ENGINEERING - I

(Civil Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a)Explain a method for testing the consistency of rainfall records at a station and necessary Adjustment
   (b)What factors you consider in selecting a site for a rain-gauge station? (8+8)

2. (a)The average rainfall over 45 ha of watershed for a particular storm was as follows:

Time (hr):	0	1	2	3	4	5	6	7
Rainfall (cm):	0	0.5	1.0	3.25	2.5	1.5	0.5	0

   The volume of runoff from this storm was determined as 2.2 ha-m. Establish the ϕ - index.
   (b)Discuss various climatic factors affecting runoff. (8+8)

3. (a) What is a S-curve hydrograph? How is it constructed? What are its uses?
   (b) Describe any two methods of separating the base flow from the total runoff. (8+8)

4. (a)Define flood routing. What are the uses of flood routing?
   (b)The observed annual flood peaks of a stream for the period 1939 to 1973 in m^3/s are as given below.
   588,432,648,396,420,500,336,900,300,600,504,396,518,420,528,384,698,610, 408,372,480,672,720,912,624,336,324,360,696,456,636,684,756,507,312
   Estimate the 50 year and 100 year floods using Gumbel's extreme value distribution (for n = 35, mean and standard deviation of reduced extremes are 0.54034 and 1.12847 respectively) (6+10)

5. (a) A 20-cm well penetrates 25 m below the static water table. After 24 hours of pumping out at the rate of 800 lpm, the water level in a test well at 80 m from the pumping well is lowered by 0.53 m and in a test well 20 m away 2.11 m. Find the coefficient of transmissibility of the aquifer.
   (b)Distinguish between
   (i) Water table and piezometric surface
   (ii) Vadose zone and phreatic zone
   (iii)Artesian well and flowing well
   (iv) Influent and effluent streams (8+8)

6. (a)The sprinkler system of irrigation is an excellent method but not used in India. Discuss critically and briefly.
   (b)What are the benefits that can be accrued from irrigation projects (8+8)

7. A stream of 130 liters per second was delivered from a canal and 100 liters per second were delivered to the field. An area of 1.6 hectare was irrigated in 8 hours. The effective depth of root zone was 1.7 m. The runoff loss in the field was 420 m^3. The depth of water penetration varied linearly from 1.7 m at the head end of the field to 1.1 m at the tail end. Available moisture holding capacity of the soil is 20 cm per meter depth of soil. It is required to determine the water conveyance efficiency, water application efficiency, water storage efficiency, and water distribution efficiency. Irrigation was started at a moisture extraction level of 50 % of the available moisture. (16)

8. (a) What are the different ways in which the irrigation canal can be aligned
   (b) Design an irrigation channel in alluvial soil according to Lacey's silt theory, given in the following data:
   Full supply discharge = 16 m^3/sec; Lacey's silt factor = 1.0;
   Channel side slopes = ½ : 1 (8+8)

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Code No: V3103/R07

Set No: 4

III B.Tech I Semester Regular & Supplementary Examinations, November 2011

WATER RESOURCES ENGINEERING - I

(Civil Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. Find the mean precipitation for the area shown in Fig.1 below by thiessen polygon method. The area is composed of a square plus an equilateral triangular plot of side 2 km. Rainfall readings are in cm at the various stations indicated.

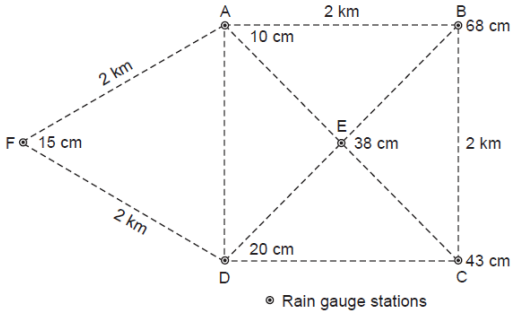

Fig 1: Rain-gauge network (16)

2. (a) Explain briefly the evaporation process. What are the factors that influence the process of evaporation?
   (b) Discuss various physiographic factors affecting runoff. (8+8)

3. (a)What do you understand by synthetic unit hydrograph? Explain how it is derived
   (b)What are the uses of unit hydrograph. (10+6)

4. (a) Differentiate between, (i) Prism storage and Wedge storage, and (ii) Channen routing and reservoir routing.
   (b)The observed annual flood peaks of a stream for the period 1939 to 1973 in m^3/s are as given below.
   588,432,648,396,420,500,336,900,300,600,504,396,518,420,528,384,698,610, 408,372,480,672,720,912,624,336,324,360,696,456,636,684,756,507,312
   Construct the probability plotting of this data on an ordinary graph paper and hence estimate 50 year and 100 year flood. (6+10)

5. (a) A well with a radius of 0.5 m penetrates completely a confined aquifer of thickness 40 m and permeability 30 m/day. The well is pumped so that the water level in the well remains at 7.5 m below the original pieozometric surface. Assuming that the radius of influence is 500 m, compute the steady state discharge from the well.
   (b)Derive an expression for the steady state discharge of well fully penetrating into a unconfined aquifer. (8+8)

6. (a)Discuss critically the quality standards required for irrigation water.
   (b)What is meant be 'Border flooding' and how does it differe from 'Check flooding' and 'Free flooding'? (8+8)

7. (a)The root zone of a certain soil has a field capacity of 25 % and permanent wilting percentage is 8%.
   (i) What is the depth of moisture in the root zone at field capacity and permanent wilting point?
   (ii) How much water is available if the root zone depth is 1.1 m? The dry weight of the soil is 13.75 kN/m^3
   (b)Write short notes on:
   (i) Outlet factor, (ii) Kor water depth (iii) soil moisture deficiency
   (iv)Field irrigation requirement (10+6)

8. (a)Describe kennedy's silt theory. What are the drawbacks in this theory?
   (b)Using Lacey's theory, design an irrigation channel for the following data:
   Discharge Q = 60 cumecs
   Silt factor f = 1
   Side slopes = 1/2 **:** 1
   (8+8)

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