Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER • 2015

Subject Code: 150602 **Date: 05-05-2015**

Subject Name: Hydrology and Water Resources Engineering

Time: 02.30 pm - 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Differentiate between low and high head power plants. Discuss components of a hydroelectric power plant. **07**

(b) With a neat sketch, describe various zones of storage in a reservoir. Also suggest measures to control reservoir sedimentation. **07**

Q.2 **(a)** What is the need for planning of water resources projects? Discuss the steps involved in the water resources planning. **07**

(b) Discuss causes of drought and drought contingency planning. **07**

OR

(b) What is meant by 'water harvesting'? Explain methods of roof water harvesting and water harvesting for agricultural use. **07**

Q.3 **(a)** **(i)** Explain various forms of precipitation. **03**

(ii) Explain the use of tipping bucket type rain gauge. **04**

(b) The rates of rainfall for successive 30 minute period of a 3-hour storm are 1.5, 3.2, 4.3, 2.7, 2.1 and 1.2 cm/hr. The surface runoff in response to the storm is estimated to be 3.0 cm. Determine ϕ-index and w-index. Consider a total of depression and interception losses of 1.0 cm. **07**

OR

Q.3 **(a)** **(i)** A rain gauge 'D' was inoperative during a specific storm. The rainfall recorded at three surrounding stations A, B and C during that storm were 52, 85 and 70 mm respectively. If the average annual rainfall of stations A, B, C and D are 650, 900, 820 and 700 mm respectively, estimate the storm rainfall of station D. **03**

(ii) The rainfall values at gauging stations and corresponding areas of Thiessen's polygons for a drainage basin are as follows: **04**

Station	A	B	C	D	E	F	G
Area of Thiessen's Polygon (km^2)	160	135	92	110	68	70	35
Rainfall (cm)	10.0	13.5	9.1	12.6	11.2	14.0	10.8

Compute the average rainfall over the basin.

(b) What are the factors that affect Evaporation? Describe any one method of measurement of evaporation. **07**

Q.4 **(a)** Explain procedure to derive s-curve hydrograph from a given unit hydrograph. What are the uses of s-curve hydrograph? **07**

(b) Discuss occurrence of groundwater with a neat sketch and define various water bearing formations. **07**

OR

Q.4 **(a)** Define Hydrograph. Draw a typical single-peaked hydrograph and explain its components. **07**

Q.4 **(b)** The ordinates of flood hydrograph for a drainage basin in response to a 6-hour storm are observed as follows: **07**

Time (hour)	0	3	6	9	12	15	18	21
Hydrograph Ordinate (cumec)	15	35	67	109	151	175	195	153

Time (hour)	24	27	30	33	36	39	42	45
Hydrograph Ordinate (cumec)	139	113	87	63	47	31	23	15

Considering total rainfall of 7 cm during the storm, average rate of infiltration loss of 0.5 cm/hr and a constant base flow of 15 cumec, derive ordinates of the 6-hour unit hydrograph. Also estimate area of the basin.

Q.5 **(a)** Discuss causes of flood. **07**

(b) Explain flood routing through reservoirs. **07**

OR

Q.5 **(a)** Write a short note on flood control by constructing levees and flood walls. **07**

(b) Briefly explain method of estimating design flood for a water resources project. **07**

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