Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC– SEMESTER III– • EXAMINATION –WINTER- 2016

Subject Code: X30601 **Date:30/12/2016**

Subject Name: Hydrology and Water Resources Engineering

Time:10:30 AM to 1:00 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) (i)Define 'Precipitation'. What are the different types of precipitation? Explain any one of them. **04**

(ii) What are the different components of hydrologic cycle? Show them with a neat sketch. **03**

(b) Distinguish clearly between 'recording rain gauge' and 'non-recording rain gauge'. What are the different types of recording rain gauges? Explain the working of any one of them in detail. **07**

Q.2 (a) Explain: Flood, Maximum probable flood, Design flood. What are the different structural and non-structural methods to control flood? Discuss any one of them. **07**

(b) Explain the term 'Flood routing' and differentiate between 'reservoir routing' and 'channel routing'. How does reservoir routing help in flood management? **07**

OR

(b) Explain the terms 'attenuation' and 'time lag'. **07**

Route the flood through a channel, using Muskingum method, for the inflow hydrograph given as:

Time (hr)	0	4	8	12	16	20	24	28
Inflow (cumecs)	42	68	116	164	194	200	192	170
Time (hr)	32	36	40	44	48	52	56	60
Inflow (cumecs)	150	128	106	88	74	62	54	50

Take storage constant (k) and dimensionless constant (x) for the given channel reach as 0.5 day and 0.278 respectively.

Q.3 (a) What are the methods of computing average depth of precipitation? Explain them in detail. **07**

Compute the average depth of rainfall and volume of rain water using Thiessen polygon method for the data given below:

Station	1	2	3	4	5	6	7	8
Rainfall (mm)	40	48	38	55	49	37	25	40
Area of Polygon (km^2)	1.5	41.5	47.2	6.6	35.8	49.8	10.4	7.2

(b) What is run-off? Explain the factors affecting run-off. **07**

OR

Q.3 (a) Results to determine the infiltration capacity (f_{ct}) in the exponential form using Horton's equation are tabulated below: **07**

Time (hr)	0.25	05	0.75	1.0	1.25	1.5	1.75	2.0
f_{ct} (cm/hr)	5.6	3.2	2.1	1.5	1.2	1.1	1.0	1.0

Obtain the infiltration capacity exponential equation as presented by Horton.

(b) Explain the following terms: **07**
Infiltration, Infiltration capacity, Pan coefficient, Evaporation, Hyetograph, Base flow, Rain gauge density.

Q.4 **(a)** Explain "Hydrograph". Sketch a typical single peak flood hydrograph and discuss different elements of flood hydrograph. **07**

(b) Explain the following terms: **07**
Radius of influence, specific yield, confined aquifer, shallow well, aquiclude, perched aquifer, coefficient of permeability, drawdown in a well.

OR

Q.4 **(a)** Explain "Unit Hydrograph". What are its uses? **07**
The ordinates of a 3-hr unit hydrograph (UH) are given:

Time (hr)	0	3	6	9	12	15	18	21	24
Ordinates 3-hr UH (cumecs)	0	10	30	80	120	50	20	5	0

Determine the ordinates of a flood hydrograph resulting from a storm of 2.5 cm effective rainfall of 3 hr duration in the basin. Assume the base flow of 5 cumecs.

(b) Distinguish between artesian well, flowing well and water table well, using a neat sketch. **07**
A fully penetrating well of 30 cm diameter draws water from a confined aquifer of permeability 0.1cm/sec and thickness 15 cm. If the steady state discharge is found to be 0.033 cumecs, compute the drawdown at a location 40 m away from the centre of the well. Take radius of influence of the well as 1000 m.

Q.5 **(a)** Explain with a suitable sketch, the movement of water below the earth surface. Also, explain the situation where the flowing well may exist. **07**
A 30 cm diameter well completely penetrates a confined aquifer of permeability 45 m/day. The length of the strainer is 20 m. Under the steady state of pumping the drawdown of the well was found to be 3 m and the radius of influence was 300 m. Calculate the discharge from the well.

(b) State and explain different methods of flood forecasting. **07**

OR

Q.5 **(a)** Discuss the application of modeling techniques in hydrology and water resources engineering. **07**

(b) What are the factors affecting evaporation? Suggest different methods to reduce evaporation from a water body. **07**

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