

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014****Subject code: 711204N****Date: 06-12-2014****Subject Name: Water Resources Engineering****Time: 10:30 am - 01:00 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) Discuss briefly the methods of flood control. **07**
 (b) Determine optimum number of rain gauges in a catchment. Use following data: **07**
 (1) Number of rain gauge = 4
 (2) Mean annual precipitation at gauge = 820, 640, 410, 560 mm.
 (3) Permissible error = 10 %

- Q.2** (a) What is unit hydrograph? Discuss the limitations and uses of unit hydrograph theory. **07**
 (b) A well penetrates into an unconfined aquifer having a saturated depth of 110 metres. The discharge is 270 litres / minute at 15 metres drawdown. Assuming equilibrium flow conditions and a homogeneous aquifer, compute the discharge at 18 metres drawdown. The radius of influence may be taken as equal in both cases. **07**

OR

- (b) Derive Thieme's formula for confined aquifer. **07**
Q.3 (a) Discuss factors affecting infiltration capacity. **07**
 (b) 3 hour unit hydrograph ordinates are given below. Find out 6 hour unit hydrograph ordinates. **07**

Time in hours	0	2	3	9	12	15	18	21	24	27	20	33
U.H.O	0	6	14	38	44	70	86	68	54	32	16	0

OR

- Q.3** (a) Discuss factors affecting runoff. **07**
 (b) The following is the set of observed data for successive 15 minute period of 120 minutes storm in a catchment. **07**

Duration(min.)	15	30	45	60	75	90	105	120
Rainfall(cm/hr)	2	2.5	10	8	6.5	3.25	4.5	1.25

If the value of ϕ - index is 3.0 cm/hr, estimate the net runoff, the total rainfall and the value of w index.

- Q.4** (a) Define flood routing. Explain trial and error method of reservoir routing. **07**
 (b) Use Gumbel's method to forecast flood for 100 years frequency. Use other data as below: **07**

Return period (years)	Peak flood (m ³ /s)
35	365
50	450

OR

- Q.4** (a) Define and explain: (1) ϕ index (2) w index **07**

- (b) Using the 3 hour unit hydrograph given below, find the peak flow resulting from three successive 3 hour periods of rainfall producing 0.25, 0.57 and 0.65 cm of runoff respectively from a basin. **07**

Time in hr	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Flow in m ³ /s	15	54	160	325	380	416	445	285	224	186	90	75	40	12	0

- Q.5** (a) Explain different types of precipitation. **07**
 (b) Explain the methods of estimating design flood. **07**
OR
Q.5 (a) Explain with neat sketch float type recording gauge. **07**
 (b) Explain hydrological cycle with neat sketch. **07**
