

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-V(New) • EXAMINATION – WINTER 2016****Subject Code:2150602****Date:17/11/2016****Subject Name:Hydrology & Water Resources Engineering****Time:10:30 AM to 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.

**MARKS****Q.1 Short Questions****14**

- 1 What do you understand by climate change?
- 2 Define the term 'Drought'
- 3 What do you understand by the term 'Water harvesting'?
- 4 Draw a typical daily rainfall mass curve for a recording rain gauge.
- 5 What is an unconfined aquifer?
- 6 Define 'Specific Capacity of a well'.
- 7 What is a flow duration curve?
- 8 State Darcy's law for ground water flow.
- 9 What do you understand by flood routing?
- 10 Define  $\phi$ -index.
- 11 Write Horton's equation for infiltration rate estimation?
- 12 Define Evapotranspiration.
- 13 Write the water budget equation.
- 14 Define unit hydrograph

- Q.2 (a)** Calculate the average annual rainfall using Thiessen polygon method for the following data: **03**

Rain gauge station	1	2	3	4	5	6	7	8
Annual rainfall (cm)	34	35	36	37	38	39	40	41
Area (Km <sup>2</sup> )	55	50	45	33	69	49	55	39

- (b)** Calculate the rainfall excess from the rainfall hyetograph data given below. Assume  $\phi$ -index = 0.25 cm/hr. **04**

Time	8 am to 9am	9 am to 10 am	10 am to 11 am	11 am to 12 noon	12 noon to 1 pm	1 pm to 2 pm	2 pm to 3 pm	3 pm to 4 pm	4 pm to 5 pm
Rainfall intensity (cm/hr)	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8

- (c)** Discuss the methods for reducing the reservoir sedimentation. **07**

**OR**

- (c)** Derive the ordinates of unit hydrograph given the flood hydrograph ordinates. Assume constant base flow of 12 cumecs. The catchment area is 100 km<sup>2</sup>. **07**

Time (hr)	0	3	6	9	12	15	18	21	24
Flood Hydrograph Ordinates (cumecs)	12	34	56	78	65	45	32	28	12

- Q.3 (a)** Explain the Rational Method for estimation of peak flood discharge. **03**

- (b)** Derive the equation for steady state discharge for a well fully penetrating a confined aquifer. **04**

- (c)** Explain with a neat sketch the various zones of storage in a reservoir. **07**

**OR**

- Q.3** (a) Explain the double ring infiltrometer with a neat sketch. **03**  
(b) Explain the causes of floods in Indian sub-continent. **04**  
(c) Draw the flow duration curve (FDC) given the discharges during 1998 to 2015. Determine the 75 percent dependable yield? **07**

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006
Discharge (cumecs)	1500	1400	1240	1108	945	750	556	347	249
Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
Discharge (cumecs)	1450	1300	1180	990	900	590	455	333	235

- Q.4** (a) Discuss the factors affecting runoff in a catchment area. **03**  
(b) A well of 10 cm diameter fully penetrates a confined aquifer of 25 m depth. The drawdown in the well is 3 m. If the hydraulic conductivity of the aquifer is 45 m/day, calculate (i) Transmissivity of aquifer (T) and (ii) discharge from the well. Assume radius of zero drawdown (R) as 300 m. **04**  
(c) Discuss the engineering measures for flood control. **07**

**OR**

- Q.4** (a) Explain the formation loss and screen loss coefficients for a well penetrating an aquifer. **03**  
(b) Explain the various investigations carried out for fixing a reservoir site. **04**  
(c) Explain with a neat sketch the components of a hydroelectric power plant. **07**
- Q.5** (a) Briefly explain the methods of base flow separation in hydrograph analysis. **03**  
(b) Discuss the various types of dams. What is the function of a spillway? **04**  
(c) Discuss the measures to be adopted for water conservation and augmentation in water scarce regions. **07**

**OR**

- Q.5** (a) Explain the double mass curve method for checking the consistency of rainfall data. **03**  
(b) Discuss the Penman-Monteith method for evapotranspiration estimation. **04**  
(c) Describe the working of Symons rain gauge and Tipping bucket type rain gauge with neat sketches **07**

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