

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2023****Subject Code:3144005****Date:19-01-2024****Subject Name: Water Resource Engineering & Hydrology****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.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1**
- (a) Discuss the following in terms of irrigation water management. (i) Duty, (ii) Crop evapotranspiration, (iii) Regime channel **03**
- (b) Unlined canals in alluvial soils are designed based on Kennedy's theory. Enlist various assumptions made in the design and write a procedure. **04**
- (c) Explain the regional hydrological cycle for Gujarat state in detail depicting all the components with a neat sketch. **07**
- Q.2**
- (a) List out three methods of applying water to land for Irrigation. Discuss one in detail. **03**
- (b) Write a short note on Khosla theory. Explain the effect of gradient on flow velocity. **04**
- (c) Explain how the watering in a crop field can be decided using daily evapotranspiration data? Assume the final soil moisture at the minimum level without plants being wilted. **07**

OR

- (c) The constant base flow of 30 cumec is derived from a storm of 3 hours. Derive the ordinates of 3-hour unit hydrograph using the data of flow given in below table. The area of the drainage basin of the stream is 400 sq.km. **07**

Sep 3		Sep 4		Sep 5		Sep 6	
Time	Flow (cumec)	Time	Flow (cumec)	Time	Flow (cumec)	Time	Flow (cumec)
3 AM	130	3 AM	110	3 AM	150	3 AM	30
9 AM	20	9 AM	90	9 AM	170	9 AM	40
3 PM	180	3 PM	95	3 PM	250	3 PM	25
9 PM	210	9 PM	105	9 PM	210	9 PM	35

- Q.3**
- (a) Draw a neat sketch of gravity dam and depict various forces acting on it. **03**
- (b) Explain Penman-Monteith method to measure evapotranspiration. **04**
- (c) Consider the following rainfall: 20, 35, 60, 22, 30 and 12 mm/hr for the successive 1-hour period of a 6 hour's storm. The corresponding surface runoff is estimated of 40 mm/hr. Calculate ϕ -index. Also determine W-index. **07**

OR

- Q.3**
- (a) Enlist different cross drainage works and explain anyone. **03**
- (b) Write a short note on areal precipitation/ rainfall estimation. Differentiate between Thiessen-polygon and drift-kriging method. **04**
- (c) Explain with sketch the Unconfined Aquifer. In which hydro-geological conditions unconfined aquifers are often found? **07**

- Q.4** (a) Draw the uplift pressure diagram for concrete gravity dam. **03**
(b) How can you estimate areal rainfall in the absence of standard rain-gauges? **04**
(c) How the rainfall over a drainage basin is measured using Isohyetal method? **07**
explain with sketch.

OR

- Q.4** (a) What are the different types of spillways? **03**
(b) Explain the modes of failure of a gravity dam. **04**
(c) Calculate the mean rainfall for a catchment having pentagon shape with 10-km length of each side. **07**

- Q.5** (a) What is safe yield? **03**
(b) What are the drawbacks of using Lacey's theory for designing the unlined irrigation channel? **04**
(c) Design an unlined irrigation channel in alluvial soil using Lacey's theory for full supply discharge (FSQ) is 13.50 cumec, longitudinal slope $S=1/4500$, manning's constant $N=0.0230$, velocity ratio $m=1$, side slope $z=0.45$. **07**

OR

- Q.5** (a) Explain hyetograph in the context of surface hydrology. **03**
(b) Describe the classification of the canals based on their alignment. **04**
(c) Design an unlined irrigation channel in alluvial soil using Kennedy's theory for $FSQ=13.50$ cumec, $S=1/4500$, $N=0.0230$, $m=1$, $z=0.45$. **07**
