

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Fifth Semester B.Tech Degree Regular and Supplementary Examination December 2022 (2019 Scheme)

**Course Code: CET 307****Course Name: HYDROLOGY & WATER RESOURCES ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

*Graph sheets may be supplied on request***PART A***(Answer all questions; each question carries 3 marks)*

Marks

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|----|--|-----|
| 1  | What are IDF curves used for?  | (3) |
| 2  | Explain the working of a tipping bucket rain gauge with a neat sketch.   | (3) |
| 3  | Explain the following terms<br>(i) Probable Maximum Flood<br>(ii) Standard Project Flood   | (3) |
| 4  | In terms of rainfall and physical characteristics of a watershed, what is meant by time of concentration?  | (3) |
| 5  | The gross commanded area for a distributory is 10,000 hectares, 75% of which can be irrigated. The intensity of irrigation for Rabi season is 60% and that for Kharif season is 30%. If the average duty at the head of the distributory is 2500 hectares per cumec for Rabi season and 1000 hectares per cumec for Kharif season, determine the discharge required at the head of the distributory from average demand consideration. | (3) |
| 6  | Differentiate between Inundation irrigation and Perennial irrigation.  | (3) |
| 7  | Which are the basic factors controlling the process of meandering?   | (3) |
| 8  | Explain the practical applications of a current meter with a neat sketch.  | (3) |
| 9  | Which are the methods used to find the yield of an open well? Explain any one method in detail.  | (3) |
| 10 | A tube well of 30cm diameter penetrates fully a confined aquifer. The length of strainer is 25m. Calculate the yield from the well under a drawdown of 4m. The coefficient of permeability of aquifer = 50m/day. Assume radius of circle of influence equal to 200m.   | (3) |

**PART B**

*(Answer one full question from each module, each question carries 14 marks)*

**Module -1**

- 11 a) The normal annual rainfall at stations A, B, C, and D in a basin are 80.97, 67.59, 76.28 and 92.01 cm respectively. In the year 1999, the station D was inoperative, and the stations A, B and C recorded annual precipitations of 91.11, 72.23 and 79.89 cm respectively. Estimate the rainfall at station D in the year 1999. (8)
- b) Explain the drawbacks of Thiessen polygon method? (6)
- 12 a) Explain the different types of precipitation. (6)
- b) The average annual rainfall of 6 stations are 82.6, 102.9, 180.3, 110.3, 98.8 & 136.7 cm. Find out whether the stations can represent the data of rainfall adequately. If not, find out the number of additional rain gauges that have to be employed. Assume that the error that can be permitted in the data = 10%. (8)

**Module -2**

- 13 a) What are the limitations of Unit hydrograph theory? (6)
- b) The rates of rainfall for successive 30 min. period of 210 min. storm are 34, 40, 120, 85, 45, 45 and 30mm/hr. Assuming  $\phi$ - index of 35mm/hr, find the net rainfall in mm, the total rainfall and the volume of W-index. (8)
- 14 a) Ordinates of a 4hr unit hydrograph are given below. Derive the ordinates of a 12hr unit hydrograph. (10)

Time (h)	0	4	8	12	16	20	24	28	32	36	40	44
Ordinates of 4hr UH (cumecs)	0	20	80	130	150	130	90	52	27	15	5	0

- b) How do the shape and size of a catchment affect runoff? (4)

**Module -3**

- 15 a) The base period, intensity of irrigation and duty of water for various crops under a canal system are given as follows. Determine the reservoir capacity if CCA is 40000 hectares, canal losses are 20% and reservoir losses are 10%. (8)

Crop	Base period (days)	Duty of water (ha/cumec)	Intensity of irrigation (%)
Wheat	120	1800	20
Sugarcane	360	1700	20
Cotton	180	1400	10
Rice	120	800	15
Vegetables	120	700	15

- b) Suggest some methods to improve duty of water. (6)
- 16 a) A certain crop is grown in an area of 2900 hectares which is fed by a canal system. The data pertaining to irrigation are as follows: (8)
- Field capacity of soil = 25%
- Optimum moisture = 11%
- Permanent wilting point = 10%
- Effective depth of root zone = 800mm
- Relative density of soil = 1.4
- If the frequency of irrigation is 10 days and overall efficiency is 23%, find (i) Daily consumptive use (ii) The discharge of water in cumecs required in the canal feeding the area.
- b) Explain the following terms (6)
- (i) Crop period
  - (ii) Base period
  - (iii) Crop ratio
  - (iv) Intensity of irrigation
  - (v) Paleo irrigation
  - (vi) Root zone depth

**Module -4**

- 17 a) Explain Pitched islands with neat sketch. (6)

- b) Explain reservoir sedimentation with a neat sketch. Suggest few measures for reservoir sediment control. (8)
- 18 a) Explain the procedure for calculating safe yield from a reservoir of a given storage capacity with the help of Mass inflow curve. (6)
- b) Explain Area velocity method in detail for the measurement of discharge of a canal. List few other methods used for computation of discharge of a canal. (8)

**Module -5**

- 19 a) Differentiate between aquifer, aquiclude, aquitard and aquifuge with suitable examples (6)
- b) A well penetrates fully a 10m thick water bearing stratum of medium sand having coefficient of permeability of 0.004m/sec. The well radius is 100mm and it is to be worked down under a drawdown of 4m at the well face. Calculate the discharge from the well. What will be the percentage increase in the discharge if the radius of the well is doubled? Take  $R = 300\text{m}$  in each case. How does the size of the well influence the discharge? Comment on your answer. (8)
- 20 a) State the assumptions of Dupuit's theory? (6)
- b) An aquifer of 20m average thickness is overlaid by an impermeable layer of 30m thickness. A test well of 0.5m diameter and two observation wells at a distance of 10m and 60m from the test well are drilled through the aquifer. After pumping at a rate of  $0.1\text{m}^3/\text{sec}$  for a long time, the following drawdowns are stabilized in these wells: first observation well, 4m; second observation well, 3m. Determine the coefficient of permeability and the drawdown in the test well. (8)

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