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Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S,FE) (FT/WP), (S3 PT) Examination May 2025 (2019 Scheme)

Course Code: CET307
Course Name: HYDROLOGY & WATER RESOURCES ENGINEERING

Max. Marks: 100   Duration: 3 Hours

PART A
(Answer all questions; each question carries 3 marks)

		Marks
1	With the help of a sketch, explain Mass curve of rainfall.	3
2	Describe the double ring method of measuring infiltration. Why is it advisable to conduct experiments with concentric cylinders, and not just one cylinder?	3
3	What do you understand by the term base flow in a stream? Why is it necessary to separate it from total runoff for the analysis of a hydrograph?	3
4	Differentiate between a direct runoff hydrograph and a unit hydrograph?	3
5	How is temporary wilting point different from permanent wilting point and ultimate wilting point?	3
6	If the transplantation of rice usually takes 16 days and delta of water is 60 cm of field. Due to rain about 15 cm demand is fulfilled. Taking 12% losses from the distributary head to watercourse head and 20% losses in water course, compute the duty of water at the head of the water course.	3
7	If you were asked to conduct gauging for a specific stretch of a river, what factors would you consider when choosing a gauging station?	3
8	Define the following: Surcharge storage, Valley storage, Bank Storage.	3
9	Explain the vertical distribution of ground water.	3
10	What is meant by draw down in well hydraulics? How is it related to cone of depression and radius of influence?	3

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

Module -1

			Marks
11	a)	Explain any three methods to determine the annual average precipitation.	7
	b)	In a watershed, the following data were recorded by a self-recording rain gauge:	7

Time since beginning of the storm (min)	Accumulated rainfall (mm)

15	15
30	40
45	60
60	75
75	95
90	135
105	170
120	175

Compute the maximum rainfall intensity , in cm/hour.

12   a)   Explain any one automatic rain gauge with the help of a sketch and also discuss the advantages of using an automatic rain gauge?   7

b)   The rates of rainfall for successive 30 min. periods of a 210 min. storm are: 35, ,40, 120, 85, 45, 45 and 30 mm/hr. Assuming a Φ index as 35 mm/hr, find the net rainfall in mm, the total rainfall and the value of w index.   7

Module -2

13   a)   Explain the parts of a single peaked hydrograph. Also explain any three factors that affect the shape of the hydrograph with the help of sketch?   6

b)   Derive the ordinates of a 6-hour unit hydrograph from a 4-hour unit hydrograph given below: 8

Time(hr)	0	2	4	6	8	10	12	14	16	18	20	22	24
4-hr UH (cumec)	0	25	100	160	190	170	110	70	30	20	6	1.5	0

14   a)   Explain S hydrograph and how this method is used to find a unit hydrograph of any given duration for the given unit hydrograph ordinates.   6

b)   The following data represents the ordinates at hourly interval for a 1-hour unit hydrograph.   8

Time(hr)	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Ordinates	0	58 0	11 00	96 0	53 0	26 0	14 0	8 0	5 0	4 0	3 0	1 6	1 0	0

Compute total runoff hydrograph resulting from a two-hour storm rainfall with effective rainfall as follows:

First hour = 2cm, and second hour = 1 cm. Assume a constant baseflow of 10 m³/s.

Module -3

15   a)   What are the factors that affect duty and what are the methods to improve duty?   6

b)   The gross commanded area for an irrigation canal is 20000 ha, out of which 75% is cultivable commanded area. The intensity of irrigation is 40% for rabi and 10% for   8

rice. If kor period is 4 weeks for rabi and 2.5 weeks for rice, determine the outlet discharge. Outlet factors for rabi and rice may be assumed as 1800 ha/cumec and 715 ha/cumec. Also calculate delta for each case.

16 a) Compare and contrast: 6

(a) Paleo and kor watering

(b) Base period and crop period

(c) Water conveyance efficiency and water distribution efficiency.

b) After how many days will you order irrigation to ensure healthy growth of crops?   8

(i) Field capacity of soil –29%

(ii) Permanent wilting percentage =11%

(iii) Density of soil =1300 kg/m³

(iv) Effective depth of root zone = 700 mm

(v) Daily consumptive use of water for the given crop =12 mm.

Do remember that for healthy growth moisture content must not fall below 25% of the water holding capacity between the field capacity and the permanent wilting point.

Module -4

17 a) Explain the various types of river training works with sketch.   6

b) The following data is available for an Indian reservoir regarding its trap efficiency and capacity inflow ratio: 8

Capacity inflow ratio	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Trap efficiency	87	92	90	95.5	96	96	96.5	97	97.5	98

Find the probable life of reservoir with an initial reservoir capacity of 40 million cubic metres and with an annual average flood inflow of 80 million cubic metres. The annual sediment inflow is found to be 22×10^4 tonnes. The specific weight of sediment may be taken as 1.15 tonnes per cubic meter. The useful life of reservoir may be assumed when its capacity is reduced to 20 % of its designed capacity.

18 a) Discuss the various factors affecting sedimentation of reservoirs and suggest some measures to control it.   6

b) The following data were collected during a stream-gauging operation in a river. Compute the discharge.   8

Distance(m)	Depth(m)	Velocity(m/s)	
		at 0.2d	at 0.8d

		$V_{0.2}$	$V_{0.8}$
0	0	0	0
0.6	0.3	0.42	0.21
1.2	1.29	0.57	0.36
1.8	2.16	0.78	0.54
2.4	2.55	0.87	0.6
3	2.22	0.81	0.3
3.6	1.68	0.75	0.51
4.2	1.41	0.69	0.45
4.8	1.05	0.63	0.39
5.4	0.63	0.54	0.33
6	0.42	0.45	0.3
6.6	0	0	0

Module -5

19 a) Distinguish between   6

    (a) Unconfined aquifer and a leaky aquifer

    (b) Water table and piezometric surface.

    (c) Open well and a tube well

b) A 20 cm well penetrated 30 m below static water level (GWT). After a long period of   8
pumping at a rate of 1800 lpm, the drawdowns in the observation wells at 12 m and 36
m from the pumped well are 1.2 m and 0.5 m respectively. Determine,

(i) the transmissibility of the aquifer.

(ii) the drawdown in the pumped well assuming R =300 m.

(iii) the specific capacity of the well.

20 a) Derive an equation for discharge in a steady radial flow in a unconfined aquifer.   6

  b) Describe the methods to measure the yield of an open well.   8

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