Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) / S5 (WP) (R) / S3 (PT) (S,FE) Examination November 2024 (2019 Scheme)

Course Code: CET 307

Course Name: HYDROLOGY & WATER RESOURCES ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1	Illustrate with neat sketch the components of a hydrological cycle	3
2	What are the methods of control of evaporation from water bodies?	3
3	Differentiate between direct runoff hydrograph and storm hydrograph	3
4	Substantiate the use of empirical methods for design flood estimation	3
5	Enlist the benefits of irrigation	3
6	Define the terms (i) root zone depth (ii) permanent wilting point (iii) consumptive use	3
7	What is meant by stage of a river. Elucidate with sketch the stage - discharge relationship	3
8	What are the causes of reservoir sedimentation?	3
9	Define the following with examples i. Aquitard ii. Aquiclude iii. Aquifuge	3
10	What do you mean by the term 'well loss'? Explain	3

PART B

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

Module -1

11	a)	Explain the methods to find the average precipitation over a catchment area	6
	b)	In a watershed area, a station A was inoperative during a storm, while station B,C, D and E surrounding A were in operation, registering 68, 75, 78 and 82mm of precipitation. The coordinates of B, C, D and E are (9, 6), (12, -9), (-11, -6) and (-7, 7) respectively with ordinates of A as (0,0). Estimate the missing storm precipitation by inverse distance method.	8

12 a) Explain the use of double ring infiltrometer for the measurement of infiltration. How will you estimate the Horton's parameter from the measured infiltration data? 7

b) In a 140 min storm the following rates of rainfall were observed in successive 20 min intervals: 6.0, 6.0, 18.0, 13.0, 2.0, 2.0 and 12.0 mm/h. Assuming φ- index as 3.0 mm/h and an initial loss of 0.8mm, determine the total rainfall, net runoff and W-index for the storm. 7

Module -2

13 a) Explain the Time characteristics of a single peak hydrograph from an isolated storm. How will you separate the base flow? 7

b) The following are the ordinates of a 6-hour storm hydrograph of a catchment area of 600 hectares. Construct a 6-h unit hydrograph for the same basin, if constant base flow is 20 cumecs. 7

Time,hrs	0.00	6.00	12.00	18.00	24.00	30.00	36.00	42.00	48.00
Discharge in m3/sec	20	125	260	215	199	157	79	35	20

14 a) Elaborate the steps involved in developing a 4hour unit hydrograph from a 3 hour unit hydrograph. 6

b) The ordinates of 3 hour unit hyrograph for a catchment is given below. Derive the ordinates of 9 hour unit hydrograph for the same catchment. Use method of superposition 8

Time(h)	0	3	6	9	12	15	18	21	24	27	30	33
Ordinates of 3-h UH	0	15	70	110	160	120	90	72	48	25	10	0

Module -3

15 a) Discuss the various methods of surface irrigation 6

b) A certain crop is grown in an area of 6000ha fed by a canal system. Field capacity of soil is 26%, optimum moisture is 12% and permanent wilting point is 10%. Effective depth of root zone is 80 cm and relative density of soil is 1.6. If the frequency of irrigation is 10 days and overall efficiency is 20%, find (i) daily consumptive use and (ii) discharge required at the head of the canal in m^3/sec. 8

16 a) What are the factors affecting duty? How can you improve the duty of water. 6

b) 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 60000 hectares, canal losses are 20% and reservoir losses are 10%. 8

Crop	Base period	Duty of water (ha/cumec)	Intensity of irrigation (%)
Sugarcane	300	1800	15
Rice	180	1200	25
Wheat	120	1000	20
Barley	120	800	10
Gram	100	700	10

Module - 4

17 a) List the objectives of river training works. Explain any two river training works for bank protection 6

b) The data pertaining to a stream gauging operation at a gauging station are given below. The rating equation of the current meter is v = 0.32 Ns + 0.032 m/sec where Ns is the number of revolutions per second. Compute the discharge in the stream by mid-section method 8

Distance from right bank (m)	0	1	3	5	7	9	11	12
Depth in m	0	0.50	1.10	1.95	1.50	1.25	0.75	0
Number of Rev	0	80	83	131	92	85	70	0
Time in Sec	0	180	120	120	120	120	150	0

18 a) What are flow duration curves? How they are constructed? 6

b) The data regarding the trap efficiency and capacity inflow ratio of a reservoir is given below. Derive the useful life of reservoir with an initial capacity of 40 million cu. m, if the average inflow rate is 40 million cu.m. and annual sediment inflow is 200,000 tons. Assume density of sediment as 1250 kg/m3. Useful life 8

terminates when capacity reduces to 20%

Capacity/inflow	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Trap efficiency, η (%)	86	92	94	95	95.5	96	96.5	97	97.4	97.7

Module -5

19 a) State the assumptions of Dupuits theory 6

b) Pumping at the rate of 1500 litres per minute from a 30cm diameter well of depth 60m in an unconfined aquifer gives a drawdown of 2m and 1.1m in observation wells located at distances 120m and 160m respectively from it. Calculate the drawdown of the pumping well and the coefficient of permeability of the aquifer. 8

20 a) Illustrate with sketches the following 8

i. Cavity type tubewell

ii. Slotted type tubewell

b) Derive an equation to find the yield of an open well by recuperation test 6

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