

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
V SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CE309

Course Name: WATER RESOURCES ENGINEERING

Max. Marks: 100

Duration: 3 Hours

*Graph sheets may be provided***PART A***Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) What are the different types of precipitation? (5)
- b) How will you determine optimum number of rain gauges for an area? (5)
- c) The areas enclosed by the adjacent isohyets of a catchment are given in table below. Determine the average depth of rainfall. (5)

Isohyets (cms)	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50
Area (sq.km)	10.0	11.2	11.6	9.3	8.4

- 2 a) The respective storm totals at three surrounding stations A, B and C are 110, 90 and 70 mm. If the normal annual precipitation amounts at stations X, A, B and C are respectively 1000, 1100, 1200 and 1250 mm, estimate the missing storm precipitation at station X using arithmetic mean method and normal ratio method. (5)
- b) If the value of k in Horton's equation is 2 and the maximum and minimum infiltration rates observed are 2 cm/hr and 0.5 cm/hr respectively, find the infiltration rates at 30 minutes interval and plot the infiltration rate curve. (6)
- c) With neat sketches discuss any two methods of base flow separation. (4)
- 3 a) The rate of precipitation observed over a catchment of 30km^2 for successive 30 min are 16, 20, 24, 36, 28, 12 and 4mm/hr. If the ϕ index is 22mm/hr, find the runoff volume in m^3 from the catchment. (5)
- b) A 6 hr UH ordinates for a basin are given below. Derive the 9 hr UH ordinates using S curve method (10)

Time (hrs)	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42
6hr UHO m^3/s	0	9	20	35	49	43	35	28	22	17	12	9	6	3	0

PART B*Answer any two full questions, each carries 15 marks.*

- 4 a) Differentiate between perennial and inundation irrigation. (3)
- b) Define Duty and Delta and derive the relationship between them. (6)
- c) The gross command area for a distributory is 2000 ha. The intensity of irrigation (6)

for wheat is 50% and that for gram is 30%. Gram has a kor period of 18 days and a kor depth of 12 cm and Wheat has a kor period of 15 days and a kor depth of 15 cm. Determine the discharge required in the distributory.

- 5 a) What are the different flooding methods of irrigation? (5)
- b) Define the terms (i) root zone depth (ii) permanent wilting (ii) consumptive use (iv) conveyance efficiency. (4)
- c) A certain crop is grown in an area of 3000 ha 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 1.4. If the frequency of irrigation is 10 days and overall efficiency is 23%, find (i) daily consumptive use and (ii) discharge required at the head of the canal in m^3/sec . (6)
- 6 a) With a neat sketch discuss stage discharge curve. (4)
- b) List the objectives of river training. Discuss repelling, attracting and deflecting groynes. (5)
- c) The current meter readings taken during gauging of a stream are given in the table below. The current meter rating is given as $v=0.05 + 0.3N$, v in m/s and N in rev/s. Compute the discharge in the stream. (6)

Distance from bank m	0.8	1.6	1.6	2.4	2.4	3	3	3.8	3.8	4.6	5.2
Flow depth m	0.5	1	1	1.6	1.6	1.8	1.8	1.2	1.2	0.6	0
Meter depth m	0.3	0.8	0.2	1.28	0.32	1.44	0.36	0.96	0.24	0.36	-
no. of revs	12	23	36	27	41	28	42	24	35	14	-
time sec	48	52	51	54	60	53	58	50	50	45	-

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) What is Flow duration curve? What are its practical applications? (6)
- b) Explain process of reservoir sedimentation and control measures for reducing it. (6)
- c) Explain the step by step procedure for determining reservoir capacity from mass inflow curve. (8)
- 8 a) What are the various factors affecting selection of site for a reservoir. (6)
- b) The data regarding trap efficiency and capacity inflow ratio of a reservoir is given in the table below. (9)

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

Derive the useful life of reservoir with an initial capacity of 50 million cu. m, if average inflow rate is 50 million cu. m and annual sediment inflow is 300,000 tons. Assume density of sediment as 1250 kg/m^3 . Useful life terminates when

capacity reduces to 20%.

- c) Define Porosity, specific yield, specific retention. Write the relation between them. (5)
- 9 a) State and derive Darcy's law. (5)
- b) Derive an expression for steady radial flow in a confined aquifer. (8)
- c) A recuperation test in an open well yielded the following water levels: (7)
- Initial water table level – 250.00m; water table level when pumping was stopped – 243.00m; water table level in well 2hr after pumping was stopped – 245.00m
- Find the safe yield of the well if working head is 3m.
