

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: CE309

Course Name: WATER RESOURCES ENGINEERING (CE)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) What are the various methods of computing average rainfall over a basin? (7)
 b) The average annual rainfall depths recorded at 5 rain gauge stations are 910,1070,1410,810 and 500mm respectively. If the average depth of rainfall over the basin is to be estimated within 10% error, determine the additional number of gauges needed. (8)
- 2 a) State the uses and limitations of unit hydrograph. (5)
 b) 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 (Cumec)	0	20	80	130	150	130	90	52	27	15	5	0

- 3 a) What are the factors that affect evaporation from a water body? (5)
 b) What is Φ index? (2)
 c) Explain the experimental method of determination of infiltration capacity using double ring infiltrometer. (8)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Explain the various methods of surface irrigation. (10)
 b) What are the objectives and classification of river training works? (5)
- 5 a) What are the factors affecting duty? (5)
 b) A water course has culturable command area of 2600 hectares out of which the intensities of irrigation for perennial sugar cane and rice crops are 20% and 40 % respectively. The duty for these crops at the head of the water course are 750 hectares per cumec and 1800 hectares per cumec respectively. Find the discharge required at the head of water course if the peak demand is 120% of the average requirement. (10)
- 6 a) Explain the stream flow measurement by area velocity method (10)
 b) Define stage discharge curve. (2)
 c) Define Flow and lift irrigation. (3)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) The following information is available regarding the relationship between trap efficiency and capacity inflow ratio for a river (10)

Capacity in flow ratio	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Trap efficiency	87	93	95	95.5	96	96.6	97	97.2	97.3	97.5

Find the probable life of the reservoir with an initial reservoir capacity of 30 million cubic meters if the annual flood inflow is 60 million cubic meters and the average annual sediment inflow is 3600000KN. Assume a specific weight of sediment equal to 12KN/m². The useful life of the reservoir will terminate when 80% of initial capacity is filled with sediment

- b) What is a flow duration curve? (5)
- c) What are the methods for the control of river sedimentation? (5)
- 8 a) Derive an expression for the yield of an open well using Recuperation test. (10)
- b) With a neat sketch describe the vertical distribution of ground water. (10)
- 9 a) Explain the method of calculating reservoir capacity for a specified yield from the mass inflow curve. (10)
- b) The amounts of water flowing from a certain catchment area at the proposed dam site are given in the following table. Determine the minimum capacity of the reservoir if water is to be used to feed the turbines of the hydropower plant at a uniform rate and no water is to be spilled over. (10)

MONTH	INFLOW (x 10 ³ m ³)
JANUARY	2.83
FEBRUARY	4.25
MARCH	5.66
APRIL	18.40
MAY	22.64
JUNE	22.64
JULY	19.81
AUGUST	8.69
SEPTEMBER	7.10
OCTOBER	7.10
NOVEMBER	5.66
DECEMBER	5.66

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

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Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks

Marks

- 1 a) Explain the components in a hydrological cycle with a neat sketch. (5)
- b) How can you obtain the optimum number of rain gauges in a catchment area? (5)
- c) Differentiate mass curve and hyetograph. (5)
- 2 a) Explain the methods to find the average precipitation over a catchment area. (6)
- b) The isohyets for annual rainfall over a catchment were drawn and areas of strips between isohyets are obtained as below. Determine the average depth of annual rainfall over the area. (5)

Isohyets(mm)	450-550	550-650	650-750	750-950	950-1150	1150-1250
Area (km ²)	1200	3000	2800	1000	900	600

- c) Define infiltration indices. (4)
- 3 a) List and explain factors affecting runoff in a catchment area. (5)
- b) What is unit hydrograph? Stating the assumptions, explain the derivation of a unit hydrograph from a storm hydrograph. (5)
- c) Ordinates of 2 hour unit hydrograph are given below. Using this derive the ordinates of a 6 hour unit hydrograph using S hydrograph method. (5)

Time (hrs)	0	2	4	6	8	10	12	14	16	18	20	22
Ordinate of 2 hour unit hydrograph (cumec)	0	25	100	160	200	170	110	70	30	20	8	0

PART B

Answer any two full questions, each carries 15 marks

- 4 a) Write the environmental effects of irrigation. (4)
- b) Differentiate between flow and lift irrigation systems. (4)
- c) Gross command of a reservoir is 50,000 hectares. The CCA is 80% of GCA. Find out the capacity of the reservoir which is able to irrigate areas as given below. Reservoir and canal losses may be taken as 5% each of water required by crops. (7)

Crop	Base period (days)	Duty (hectares/cumec)	Intensity of irrigation as % of CCA
Wheat	120	2000	25
Rice	140	900	18.75
Cotton	180	1600	12.50

- 5 a) Define field capacity, permanent wilting point and available moisture. (4)
- b) A loam soil has field capacity 27% and permanent wilting percentage 12%. The dry weight of the soil is 13.73 kN/m³. If the depth of the rootzone is 1 m, determine the storage capacity of the soil. Irrigation water is applied when the (6)

moisture content drops to 15%. If the water application efficiency is 75%, determine the water depth require to be applied in the field.

- c) Define duty and delta. Derive the relation between them. (5)
- 6 a) What is river training? What are the objectives of river training? What are the classifications? (8)
- b) Explain Guide banks and groynes with neat sketches. (7)

PART C

Answer any two full questions, each carries 20 marks

- 7 a) What are the storage zones in a reservoir? (5)
- b) Define trap efficiency. Explain the method to find useful life of a reservoir. (10)
- c) Differentiate mass curve and demand curve. (5)
- 8 a) Define porosity, specific yield and specific retention. Establish a relation between them. (5)
- b) Explain and derive steady state flow to wells in a confined aquifer. (10)
- c) Explain Darcy's law. (5)
- 9 a) Explain recuperation method to find yield from an open well. (5)
- b) A well is to be constructed in a fine sandy subsoil formation. The discharge of the well is anticipated to be $0.004 \text{ m}^3/\text{s}$ under depression head of 4 m. Find the diameter of the well. Given (K/A) for sandy soil = $0.5 \text{ m}^3/\text{hr}/\text{m}^2$ of area under depression head of 1 m. (8)
- c) Explain with sketch strainer type tube well. (7)

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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 30minutes 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 30km² 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 m³ 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.
