

Total No. of Questions : 12]

SEAT No. :

P2360

[4758] - 501

[Total No. of Pages :5

T.E. (Civil)

HYDROLOGY AND WATER RESOURCES ENGINEERING
(2012 Course) (Semester - I) (End Semester) (301001)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of Calculator is allowed.

Q1) Explain the procedure for developing depth-area-duration curves. What are the applications of these curves. **[8]**

OR

Q2) A storm with 10cm precipitation produced a direct surface runoff of 5.8cm in the equivalent depth unit. The time distribution of the storm is given in the Table below. Estimate the Φ -index of the storm and the excess rainfall hyetograph. **[8]**

Time from start (hr)	1	2	3	4	5	6	7	8
Incremental rainfall in each hour (cm)	0.4	0.9	1.5	2.3	1.8	1.6	1.0	0.5

Q3) What do you understand by sub-surface irrigation? Describe it with the help of neat sketches. **[6]**

OR

Q4) The gross command area (GCA) of an irrigation canal is 1,20,000 ha. The culturable command area (CCA) is 75% of GCA and the intensities of irrigation for Kharif and Rabi crops are 40% and 55%, respectively. If the duties of water at the canal are 800 and 1550 ha for Kharif and Rabi crops, respectively, determine the head discharge of the canal. **[6]**

P.T.O.

Q5) A fully penetrating well with radius r_w in a confined aquifer is located at the centre of a circular groundwater basin having constant head boundary conditions at the outer periphery. The well is recharged maintaining a constant head at the well face. Find the recharge rate per unit rise at the well face considering flow as laminar. [6]

OR

Q6) A well 0.4m in diameter is being pumped at the rate of 1400 lit/min. The draw downs in the adjacent two wells at distances 5m and 19m, respectively, are 9m and 2.5m, respectively. The depth of impervious strata is 100m below the ground water level. Determine: [6]

- coefficient of permeability,
- draw down in the well if the observed points lie on the same draw down curve.

Q7) a) With the help of typical hydrographs describe the salient features of [6]

- perennial,
- intermittent
- ephemeral streams.

- The 3-h unit hydrograph (UH) for a basin has the following ordinates. Using the S-curve method, determine the 9-h unit hydrograph ordinates of the basin. [8]

Time (hr)	0	3	6	9	12	15	18	21	24	27	30
3-h UH ordinates (m ³ /s)	0	12	75	132	180	210	183	156	135	144	96
Time(hr)	33	36	39	42	45	48	51	54	57	60	
3-h UH ordinates (m ³ /s)	87	66	54	42	33	24	18	12	6	6	

- c) What do you understand by time of concentration of a catchment? Describe briefly any one method of estimation of the time of concentration. [4]

OR

- Q8)** a) Write a brief note on frequency factor and its estimation in Gumble's method. [6]

- b) Explain briefly the terms: [4]

- i) design flood,
- ii) standard project flood,
- iii) probable maximum flood,
- iv) design storm.

- c) The following table gives the ordinates of a direct -runoff hydrograph resulting from two successive 3-h durations of rainfall excess values of 2cm and 4cm, respectively. Derive the 3-h unit hydrograph for the catchment. [8]

Time (h)	0	3	6	9	12	15	18	21	24	27	30
Direct run off (m ³ /s)	0	120	480	660	460	260	160	100	50	20	0

- Q9)** a) Explain types of reservoirs and explain the points considered for selecting the site for reservoir and state the investigation required for construction of a reservoir. [8]

- b) A proposed reservoir has a capacity of 400 ha-m. The catchment area is 130km² and the annual stream flow averages 12.31cm of runoff. If the annual sediment production is 0.03 ha-m/km², what is the probable life of the reservoir before its capacity is reduced to 20% of its initial capacity by sediment deposition. The relation between trap efficiency (η_{trap}) and capacity-inflow (C/I) ratio is given below: [8]

C/I	$\eta_{\text{trap}} \%$	C/I	$\eta_{\text{trap}} \%$
0.1	87	0.002	2
0.2	93	0.003	13
0.3	95	0.004	20
0.4	95.5	0.005	27
0.5	96	0.006	31
0.6	96.5	0.007	36
0.7	97	0.008	38
1.0	97.5	0.01	43
		0.015	52
		0.02	60
		0.03	68
		0.04	74
		0.05	77
		0.06	80
		0.07	82

OR

- Q10)** a) What is meant by trap efficiency of a reservoir? What factors influence its value? [6]
- b) Write a note on benefit-cost studies for reservoir. Explain any two methods. [8]
- c) Explain in brief-flood routing. [2]

- Q11)**a) What is water logging? What are the ill effects of water logging? State the methods to improve the sub-surface drainage. [8]
- b) What are the merits and demerits of tile drains? [4]
- c) Write a short note on ancient system of water distribution. [4]

OR

- Q12)**a) What is lift irrigation scheme? Explain the investigations necessary and approvals required for its implementation. State the design considerations for the components of lift irrigation scheme. [8]
- b) What are the major, medium and minor irrigation projects? What are advantages and disadvantages of irrigation? [4]
- c) Derive the expression for spacing for the tile drain. [4]

