BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - VIII CIVIL :SUMMER- 2022
SUBJECT : WATER RESOURCES ENGINEERING

Day : Thursday

Date : 16-06-2022   **S-13639-2022**

Time : 02:30 PM-05:30 PM

Max. Marks : 60

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N.B.

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable calculator is allowed.
4) Assume suitable data if necessary.

Q.1 **a)** State various types of precipitation. **(05)**

b) What is meant by mass curve of rainfall and rainfall hyetograph? Explain. **(05)**

OR

a) Explain the procedure of drawing Depth-Area –Duration curves. **(05)**

b) Explain with a sketch working of float type of recording type rain gauge. **(05)**

Q.2 **a)** State the various factors affecting infiltration. **(04)**

b) An isolated 3hr storm occurred over a basin in the following fashion: **(06)**

% Catchment Area	ϕ index cm/hr	Rainfall (cm)		
		1st Hour	2nd Hour	3rd Hours
30	0.9	1.4	2.0	1.1
40	1.2	1.6	2.1	1.8
30	0.7	1.2	0.9	0.8

Estimate total run off from the catchment due to storm.

OR

a) Explain with a sketch standard evaporation pan for measurement of evaporation. **(04)**

b) The mass curve of rainfall of 80 minutes duration is given below. If the catchment had ϕ index of 0.9 cm/hr. Calculate the total surface run off from the catchment. **(06)**

Time from start of rainfall (min)	0	20	40	60	80
Cumulative rainfall (cm)	0	0.9	1.6	2.5	3.2

Q.3 **a)** Explain ultrasonic method of measurement of velocity of stream flow. **(04)**

b) The following are the ordinates of 3 hour unit hydrograph. Derive the ordinates of a 6 hour unit hydrograph for the same catchment. **(06)**

Time (Hour)	0	3	6	9	12	15	18	21	24
3 Hour UH Ordinates (m³/s)	0	1.6	3.0	6.4	8.0	6.2	4.4	2.2	0

P.T.O.

OR

a) Explain rational method of estimation of floods. (04)

b) The ordinates of 6 hour unit hydrograph are as given below: (06)

Time (Hour)	0	6	12	18	24	30	36	42	48	54
3 Hour UH Ordinates m³/s	0	15	35	80	62	48	30	22	10	0

If two successive storms of 6 hours internal of rainfall magnitudes 3.2 cm and 2.8 cm occur successively. Assuming ϕ index of 0.4 cm/hr and a base flow of 15 m³/s. determine resulting flood hydrograph of the flow.

Q.4 a) Explain various investigations for reservoir planning. (04)

b) The following data were obtained from the stability analysis of gravity dam.: (06)

   i)   total over turning moment at toe = 1.2×10^6 kN m

   ii)   total resting moment at toe = 1.5×10^6 kN m

   iii) total vertical force above base = 52,000 kN

   iv)   base width of the dam = 52 m

   v)   slope of down stream face = 0.8 H: 1V

Calculate the maximum and minimum vertical stress to which foundation will be subjected to. Assume that there is no tail water and upstream face of the dam is vertical.

OR

a) What is elementary profile of gravity dam? Derive the formula for base width of elementary profile for no tension and no sliding condition. (05)

b) State various forces acting on gravity dam and explain computation of earthquake forces. (05)

Q.5 a) Define phreatic line. Explain the procedure of drawing a phreatic line for homogeneous section of earth dam with drainage blanket. (05)

b) Explain with sketches measures adopted for safe drainage seepage water through the body of an earth dam. (05)

OR

a) State and explain causes of failure of earth dams. (05)

b) Explain with a neat sketch, slip circle method of stability of side slopes of an earth dam. Derive the formula for factor of safety. (05)

Q.6 a) Explain with neat sketch various components of spillway and state the function of each. (04)

b) An Ogee spillway has 6 crest gates each having 10 m clear span. Find the maximum flood that can be safety passed by lifting all the gates when the maximum reservoir elevation is 95 m and crest level is 90m. Assume coefficient of discharge as 2.1 coefficients of end contraction are 0.01 and 0.1 for the piers and abutment respectively, Neglect velocity of approach. (06)

OR

a) What is stilling basin? Explain with a sketch USBR type II stilling basin. (04)

b) Following data were recorded for an Ogee Spillway: (06)

   i)   Maximum water level = 102 m

   ii)   Maximum flood discharge = 3000 cumec

   iii) Effective length of spillway = 92 m

   iv)   Coefficient of discharge = 2.2

Determine R.L. of crest of spillway.

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