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

Day : Friday | Time : 02:30 PM-05:30 PM

Date : 25-11-2022 | **W-13639-2022** | Max. Marks : 60

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)** What is the difference between recording and non-recording type rain gauge? Explain the working of any one type of non-recording type rain gauge. **(05)**

b) Explain the intensity-duration-frequency relationship relating to the precipitation over a basin. **(05)**

OR

a) State applications of hydrology in various Civil Engineering Projects. **(05)**

b) Analysis of data on maximum one day rainfall at Pune indicated that a depth of 250 mm had a return period of 50 years. Determine the probability of one day rainfall depth equal to or greater than 250 mm at Pune occurring once in 20 successive years. **(05)**

Q.2 **a)** Describe the factors affecting evapotranspiration process. **(04)**

b) A reservoir had an average surface area of 25 km^2 during August 1985. In that month the mean rate of inflow = 12 m^3/s, out flow = 15 m^3/s monthly rainfall = 11 cm and change in storage = 15 million m^3. Assuming seepage losses to be 1.6 cm. Estimate the evaporation in that month. **(06)**

OR

a) Explain the factors affecting the infiltration capacity of an area. **(04)**

b) The mass curve of rainfall of 100 min duration is given below: If the ϕ index of the catchment is 0.5 cm/hr. Calculate the total surface run off from the catchment. **(06)**

Time from start of rainfall (min)	0	20	40	60	80	100
Cumulative rainfall (cm)	0	1.0	1.5	2.9	3.3	4.8

Q.3 **a)** Explain rational method of flood estimation. **(04)**

b) The peak of flood hydrograph due to a 3 hour duration isolated storm in a catchment is 290 m^3/s. The total depth of rainfall is 6 cm. Assuming an average infiltration loss of 0.3 cm/hr and a constant base flow of 15 m^3/s, estimate the peak of 3 hour unit hydrograph of this catchment. **(06)**

OR

a) Define unit hydrograph and state uses of unit hydrograph. Also state limitations of unit hydrograph theory. **(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	60	66
Ordinates 6 Hour UH m^3/s	0	22	60	148	122	92	64	50	30	22	10	0

A storm had two successive 6 hours interval rainfall of magnitude 3.5 and 5.2 cm respectively. Assuming a ϕ index of 0.25 cm/hr and a base flow of 20 m^3/s. Determine the resulting flood hydrograph.

P.T.O.

Q.4 **a)** With the help of neat sketch explain various storage zones in the reservoir. **(04)**

b) A masonry dam 10 m high is trapezoidal in section with a top width of 1 m and bottom width 8 m. The upstream face is vertical. Calculate the total water pressure on upstream face of dam. Assume free board to be 2 m. Also calculate the weight of dam. Assume unit weight of masonry as 22 kN/m^3. **(06)**

OR

a) Explain the process of curtain grouting and consolidation grouting for foundation treatment of dams. **(05)**

b) State the various load combination and criteria for structural stability of gravity dam. **(05)**

Q.5 **a)** What is phreatic line? What is necessity of locating phreatic line? **(05)**

b) State and explain various causes of failure of earth dam. **(05)**

OR

a) Explain with a neat sketch procedure of drawing a phreatic line for a zoned type of earth dam. **(05)**

b) Explain with sketches various measures adopted to reduce seepage from the body of earth dam and its foundation. **(05)**

Q.6 **a)** Explain with neat sketch hydraulic jump type and bucket type of energy dissipaters below spillways. **(04)**

b) Explain USWES method of hydraulic design of Ogee spillway. **(06)**

OR

a) Explain with a sketch various components of spillway and state functions of each components. **(05)**

b) Explain the functions of following components of hydropower plant: **(05)**

i) Pen stock

ii) Surge tank

iii) Tail race tunnel

iv) Head race tunnel

v) Draft tube

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