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10CV55

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022

Hydrology and Irrigation Engineering

Time: 3 hrs. Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

1 a. How do you estimate the average rainfall over a basin by Thiessen polygon method? Explain with sketch. **(05 Marks)**

b. A catchment area is in the shape of regular pentagon. If the rainfall values resorted during a storm at three successive corners of the pentagon are 48, 62 and 76 mm, determine the Theissen average. **(05 Marks)**

c. What is meant by Hyetograph and mass curve of rainfall? Construct mass curve and hyetograph for storm of duration 50 minutes. The rain gauge records are at every 5 minutes interval are 0, 0.1, 0.2, 0.8, 1.5, 1.8, 2.0, 2.5, 2.7, 2.9 and 3.1 cm respectively. **(10 Marks)**

2 a. Briefly explain the empirical method of estimation of evaporation. **(04 Marks)**

b. The class A pan is brought to the datum level every day at 8 AM in a meteorological station. The depth of water added (+) and removed during a particular week is +12, +5, +2, –3, +1, +6 and +11 mm respectively and the rainfall recorded during the same week is 0, 6, 8, 12, 9, 5 and 0 mm respectively. What is the average evaporation during that week? Take $K_p = 0.8$. **(06 Marks)**

c. How do you estimate parameters of Horton's infiltration capacity equation? Explain. **(05 Marks)**

d. Eight hour rainfall over a catchment yielded runoff of 6 cm. The recorded hours rainfall are 0.6, 1.3, 2.2, 3.1, 2.0, 1.6, 0.8 and 0.5 cm respectively. Determine ϕ index. **(05 Marks)**

3 a. With neat sketches, explain preposition of unit hydrograph. What are the assumptions made in unit hydrograph theory? **(10 Marks)**

b. Three hour unit hydrograph ordinates measured at every hour interval in m^3/s are 0, 16, 58, 173, 337, 440, 400, 285, 215, 165, 122, 90, 60, 35, 16 and 0 respectively. Obtain the peak of runoff due to two successive storms of 0.35 and 0.85 cm of 3 hour duration each on this basin. What is peak flow when it occurs? **(10 Marks)**

4 a. Explain the method of stream flow routing by Muskingum method. **(10 Marks)**

b. Briefly explain the method of estimation of design flood using Rational method. **(05 Marks)**

c. The time of concentration of an impervious drainage basin of area 2.5 km^2 is 50 minutes. The 50 year rainfall intensity for the drainage basin follows equation $I = \frac{35}{(t+10)^{0.38}}$. What is the design discharge for the drainage basin with return period 50 years? **(05 Marks)**

PART – B

5 a. List the advantages and disadvantages of irrigation. **(08 Marks)**

b. What are the advantages of Gravity irrigation over lift irrigation? **(05 Marks)**

c. List out the environmental impacts of irrigation. **(07 Marks)**

6 a. Mention classification of Indian Soils. **(05 Marks)**

b. Explain with a neat sketch, the presence of Soil – moisture in different zones. **(05 Marks)**

c. Determine the frequency of Irrigation using the following data :
Field capacity = 27% ; Permanent wilting point = 13% ; Density of soil = 1.5 g/cm^3 ; Depth of Root zone = 1.25 mt ; Daily consumptive use of water = 20mm. Readily available moisture in soil 80% of available moisture content. **(10 Marks)**

7 a. What are the different methods of assessment of irrigation water charges? Discuss the benefits and drawbacks of each method. **(12 Marks)**

b. Define duty delta and base period. Obtain the interrelationship between them. **(08 Marks)**

8 a. What are the factors to be considered in finalization of alignment of canal? **(06 Marks)**

b. Compare Kennedy's and Lacey's theory of design of canal on alluvial soils. **(06 Marks)**

c. A channel section is to be designed for the following data:
Discharge Q = 5 cumec
Silt factor f = 1.0
Side slope = $\frac{1}{2}$ H : 1V.
Also determine bed slope of channel. **(08 Marks)**

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