[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2125)

15166

B. Tech 5th Semester Examination

Hydrology and Groundwater (NS)

CE-314

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. (a) What is a hydrological cycle? How does it keep a balance between the water of the earth and the moisture in the atmosphere? What is the importance of hydrologic cycle in hydrologic analysis? (15)

   (b) What is role of water in national development? (5)

2. Thiessen polygons constructed for a network of 10 raingauges in a river basin yielded thiessen weights of 0.10, 0.16, 0.12, 0.11, 0.09, 0.08, 0.07, 0.11, 0.06 and 0.10. If the rainfalls recorded at these gauges during a cyclonic storm are 132, 114, 162, 138, 207, 156, 135, 158, 168 and 150 mm respectively. Determine the average depth of rainfall by Thiessen mean method. Also determine the volume of surface runoff at basin outlet if 35% of the rainfall is lost as infiltration. Take the area of basin as 5800km^2 and express your answer in million cubic meters. (20)

[P.T.O.]

SECTION - B

3. (a) Assuming the initial infiltration rate of 10 mm/hr, final infiltration rate of 5 mm/hr and constant value (describing the rate of decay of the difference between the initial and final infiltration rates) as 0.95 h^{-1}, calculate the total infiltration for a storm lasting 6 hours. (10)

   (b) In a catchment of area 250 km^2 having total runoff of 77 x $I0^6$ m^3 in a storm where in ground water contribution is 2 x 10^6 for a rainfall distribution as follows compute the φ - index.

Hour	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16
Rainfall (cm/hr)	2.5	5.0	5.0	3.5	2.0	2.0	1.5	1.5

(10)

4. (a) Discuss various factors which affect the evaporation from a water body. What is importance of evaporation control of reservoirs and possible methods of achieving the same? (10)

   (b) List various factors affecting the seasonal and annual runoff from a catchment. Describe briefly the interaction of various factors listed. (10)

SECTION - C

5. Given below are the ordinates of 6-h unit hydrograph

Time (Hours)	0	6	12	18	24	30	36	42	48	54	60
Ordinates of 6-h UH (m^3/s)	0	300	700	800	600	400	200	150	100	50	0

A storm of three successive 6 hour intervals had rainfall of 3.0, 4.5 and 2.5 cm respectively. If φ index is 0.25 cm/hr and base flow 20 m^3/s, determine the ordinates of hydrograph of flow. (20)

6. (a) A basin has 400 km^2 of area, L = 35 km and L_{ca} = 10 km. Assuming C_t = 1.5 and C_p = 0.70 develop a 3-h synthetic unit hydrograph for this basin using Snyder's method. (10)

(b) Explain in detail the Gumbel's method of flood frequency analysis. (10)

SECTION - D

7. (a) What is an Aquifer? Briefly discuss various types of aquifers and their properties. Differentiate between confined and unconfined groundwater flow under Dupit's assumptions. (10)

   (b) During a recuperation test, the water in an open well was depressed by pumping by 2.1 m and is recuperated by 1.6 m in 10 minutes. Find the diameter of a well to yield 10 L/s under a depression head of 2 m. (10)

8. A well penetrates fully a confined aquifer 10 m thick (saturated thickness) having coefficient of permeability of 0.0005 m/s. The radius of well is 10 cm. There is drawdown of 4 m at the well face and its radius of influence is 300 m. Calculate the steady state discharge which can be withdrawn from this well. What will be the percentage increase in the discharge if the radius of well is doubled? (20)

SECTION - E

9. Reply the following (tick the right one):
   1. The nearest object from a raingauge should be at a minimum distance equal to
      (a) Its height (b) twice its height
      (c) thrice its height (d) height calculated using a formula
   2. The chart removed from a recording type raingauge gives
      (a) a rainfall hyetograph (b) an isohyetal map
      (c) a rainfall mass curve (d) an intensity duration curve
   3. The typical characteristic of convective showers is that they are of
      (a) high intensity and long duration
      (b) high intensity and short duration
      (c) low intensity and long duration
      (d) low intensity and short duration

[P.T.O.]

4. The wind velocity at a height of 2 m above the ground is 15 km/h. What would be the velocity at a height of 10 m above the ground?
   (a) 19 km/h (b) 75 km/h
   (c) 3 km/h (d) 50 km/h

5. The salinity in water
   (a) reduces the evaporation
   (b) does not affect evaporation
   (c) increases the evaporation
   (d) difficult to say

6. In the standard notation the Horton's infiltration equation is given by
   (a) $f = f_c + (f_0 - f_c)e^{-kt}$ (b) $f = f_c + (f_c - f_0)e^{-kt}$
   (c) $f = f_c + (f_0 + f_c)e^{-kt}$ (d) $f = f_c + (f_0 - f_c)e^{kt}$

7. A 6-h storm of uniform intensity and a total rainfall of 8 cm produced a runoff of 5 cm. What is the runoff produced by a 12-h storm of uniform intensity and a total rainfall of 11 cm assuming ϕ index to be same during both the storms?
   (a) 5 cm (b) 8 cm (c) 11 cm (d) 9 cm

8. A geological formation which may contain water but is essentially impermeable to the flow of water through it is known as
   (a) aquifer (b) aquifuge
   (c) aquitard (d) aquiclude

9. The dimensions of the transmissivity of the aquifer 'T' are
   (a) LT^{-1} (b) L^2T^{-1}
   (c) L^2T^2 (d) L^2T^{-2}

10. The surface obtained by joining the water levels in several observation wells penetrating a confined aquifer represents
    (a) piezometric surface (b) water table surface
    (c) capillary fringe (d) cone of depression

(10×2=20)