Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2017**

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| **Code :** | **14CE3027** | **Duration :** | **3hrs** |
| **Sub. Name :** | **HYDROLOGIC PROCESSES** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Describe the important properties of water. | CO3 | 5 |
| b. | The average annual rainfall in cm at four existing rain gauge stations are 105, 79, 70 and 66. If the average depth of rainfall over a basin is to be estimated within 10 % error, determine the additional number of gauges needed. | CO2 | 15 |
| (OR) | | | | |
| 2. | a. | Describe the procedure of preparing the Depth-Area-Duration curve in hydrologic analysis. | CO2 | 10 |
| b. | The rainfall at station X, is missing and the rainfall at the surrounding stations along with the absolute coordinates with reference to station A whose coordinates are taken as (0,0) is shown in the following table. Estimate the rainfall at the station X.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Station | X | A | B | C | D | E | F | | Rainfall(cm) | ? | 4.5 | 5.0 | 4.6 | 5.2 | 5.0 | 5.5 | | x | 0 | 7 | 2 | 5 | 5 | 4 | 3 | | y | 0 | 3.5 | 10 | 3 | 5 | 3 | 4 | | CO2 | 10 |
| 3. | a. | Explain the various sources of streamflow and types of flow occurring on the surface due to this. | CO3 | 10 |
|  | b. | Which is the most suitable routing method for deriving a discharge-storage relationship in a river? Elaborate the Method. | CO3 | 10 |
| (OR) | | | | |
| 4. | a. | Three points on a rating curve of a stream gauging station obtained from eye-fit for the stage discharge data have the following coordinates: ( 100m3/sec, 121.67 m), (200m3/sec, 122.23 m), and (400 m3/sec, 123.04 m). Determine the equation of the rating curve and compute the discharge in the stream corresponding to a stage of 124.5m. | CO3 | 15 |
|  | b. | Elaborate the various stages used for stream flow measurements | CO3 | 5 |
| 5. |  | Given below are the observed flows from a storm of 4-h duration on  a stream with a drainage area of 1600 km2. Derive and plot the 4-hr  unit hydrograph assuming a constant base flow of 100 m3/sec.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Time (day) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Flow (m3/sec) | 100 | 1000 | 830 | 630 | 520 | 420 | 350 |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Time (day) | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | Flow (m3/sec) | 280 | 218 | 180 | 155 | 130 | 110 | 100 | | CO2 | 20 |
| (OR) | | | | |
| 6. |  | The ordinates of a 6-hour unit hydrograph of a catchment is given below:   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Time, Hour | 0 | 3 | 6 | 9 | 12 | 15 | 18 | | Ordinate of 6h UH | 0 | 25 | 50 | 85 | 125 | 160 | 185 |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Time, Hour | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 69 | | Ordinate of 6h UH | 160 | 110 | 60 | 36 | 25 | 16 | 8 | 0 |   Derive the flood hydrograph in the catchment due to the storm given below. The storm loss rate (ɸ-index) for the catchment is estimated as 0.25 cm/hr. The base flow can be the beginning and increasing by 2.0 m3/s for every 12 hours till the end of the direct runoff hydrograph.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Time from start of storm (h) | 0 | 6 | 12 | 18 | | Accumulated rainfall (cm) | 0 | 3.5 | 11 | 16.5 | | CO2 | 20 |
| 7. | a. | Explain the water budget method of reservoir evaporation estimation. | CO1 | 6 |
|  | b. | Estimate the daily evaporation from a water surface using the Penman’s approach, at a place of Latitude 20º N from the following Data. Air temperature = 26o C; Saturation vapour pressure at 26o C = 33.608 mb; Vapour pressure of air = 13.25 mm of mercury; Number of sunshine hours = 7.6; Maximum probable bright sunshine hours =13.2; Solar radiation = 958 cal/cm/day; Wind velocity at 2 m height = 2.5 m/s; Atmospheric pressure = 752 mm of mercury, | CO1 | 14 |
| (OR) | | | | |
| 8. | a. | Explain the factors influencing the infiltration. | CO3 | 12 |
|  | b. | A 7-hour storm produced the following rainfall intensities (mm/hr) at half an hour intervals over a basin of area 1830 km2 is 4, 9, 20, 18, 13, 11, 12, 2, 8, 16, 17, 13, 6 and 1. If the corresponding observed runoff is 36.6 million m3 , estimate Φ – index for the storm. | CO3 | 8 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Enumerate the various processes undergone by water in the surface, subsurface and in the atmosphere. Explain with a diagram the complete circulation processes. | CO1 | 10 |
|  | b. | Explain the significance of radiation in atmosphere with reference to condensation. | CO1 | 5 |
|  | c. | What do you mean by hydrologic budget or water balance of drainage basin? | CO1 | 5 |

ALL THE BEST