



P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belgaum)
Sixth Semester, B.E. - Civil Engineering
Semester End Examination; June/July - 2015
Hydrology and Water Resources Engineering

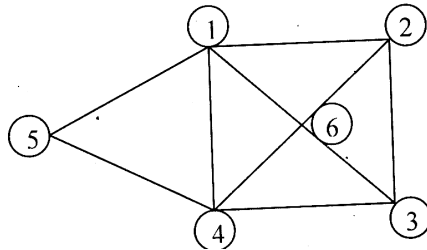
Time: 3 hrs

Max. Marks: 100

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

PART - A

1. a. Define Hydrology, Mention the practical applications of hydrology 4
- b. What is a double mass curve? Explain the procedure of Double mass curve technique. 7
- c. Find the mean precipitation for the area sketched below using Thiessen polygon method. The area is composed of a square and an equilateral triangular plot of side 4 km. Rain fall readings are 4.8, 13.0, 8.0, 5.4, 3.2 and 9.4 cm respectively.



2. a. Define evaporation and Infiltration. What is the effect of vegetative cover on these two processes? 4
- b. Following data pertains to a large reservoir with water spread area of 15 km². The data represents the average values for the day. $e_a = 11.62$ mm of mercury and $e_s = 25.27$ mm of mercury. Barometric pressure = 750 mm of mercury. Wind speed at 0.5 m above ground level = 25.3 km/h and $K_m = 0.367$ in Mayer's formula. Estimate the average daily evaporation loss from the reservoir using Mayer's and Rohwer's formula. 8
- c. A catchment area of 30km² has one recording gauge. During a storm, following mass curve of rainfall was recorded. If the volume of run off due to the storm is 1.2×10^6 m³, estimate the Φ -index for the catchment. 8

Time from start of storm in hrs	0	2	4	6	8	10	12	14
Accumulated rain in mm	0	6	17	57	70	81	87	90

3. a. What is run off? Explain the components of run off. 6
- b. Explain the components of a hydrograph with a neat sketch 6
- c. The ordinates of 3-h unit hydrograph are given below. Find the ordinates of a 6-h unit hydrograph for the basin. What is the peak value of discharge in this unit hydrograph? 8

Time in h	0	3	6	9	12	15	18	21	24	27	30
Ordinates m ³ /s	0	10	25	20	16	12	9	7	5	3	0

- 4 a. Distinguish between confined aquifer and unconfined aquifer. 4
- b. Define: i) Specific yield ii) Storage coefficient iii) Transmissibility. 4
- c. State Darcy’s law for ground water flow and mention its limitations. 4
- d. A 20 cm diameter well penetrates fully into a confined aquifer of thickness 25 m. When this well is pumped at the rate of 200 lpm, the steady state draw down in two observation wells located at 10 m and 100 m distance from the pumping well were found to be 3.5 m and 0.05 m respectively. Calculate permeability and transmissibility of the aquifer. 8

PART - B

- 5 a. What is stream flow? Explain how it can be measured using area-velocity method? 6
- b. Data pertaining to a CMG is given below, the rating equation for the current meter is $V = 0.04 + 0.9N$, where V is in m/s and N is in revolution per second. Determine the discharge by the mid-section method. 14

Distance from Bank in m	0.5	1.1	1.7	3.5	4.5	5.1	5.5				
Depth in m	1.0	4.0	5.5	6.0	3.0	1.0	0				
Current meter depth in m	0.6	3.2	0.8	4.4	1.1	4.8	1.2	2.4	0.6	0.6	0
Revolutions	15	30	50	40	65	45	65	25	40	20	-
Time in sec.	50	50	50	50	50	50	50	50	50	50	-

- 6 a. What is reservoir sedimentation? List out the methods of controlling it. 5
- b. A reservoir has a capacity of 10 Mm³ and is fed by catchment of area 250 km². Mean annual runoff at the site is 400 mm. The annual sediment yield and the specific weight of the sediment deposits are to be 1000 metric tons per km² and 12 kN/m³ respectively. Calculate the time it will take for the reservoir to fill up with sediments. The trap efficiency Y may be approximated by $Y = 100 \left(1 - \frac{1}{100X + 1} \right)^{1.5}$ where X is C-I ratio. 15

- 7 a. Make a note on water wealth of India. 6
- b. Name six major river basins of India and give their surface and ground water potential. 6
- c. Explain any one water resources project of Karnataka in detail. 8
- 8 a. What is rain water harvesting? Mention the advantages of rain water harvesting. 6
- b. Explain with a neat sketch roof top rain water harvesting. 8
- c. Explain surface and sub surface methods of ground water recharge. 6