# [5460]-501

## T.E. (Civil)

# HYDROLOGY AND WATER RESOURCE ENGINEERING

## (2015 Pattern)

*Time : 2½ Hours]*                                                      *[Max. Marks : 70*

*Instructions to the candidates:*

1) *Attempt Q.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10, Q.No.11 or 12.*
2) *Assume suitable data if necessary.*
3) *Draw a neat sketch wherever necessary.*
4) *Figures to the right indicate full marks.*

**Q1)** a) Estimate the total volume of rainfall water received in $m^3$ over a basin of 4444 hectare for following data : **[4]**

| Station | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Polygon area (ha) | 518 | 777 | 906 | 1495 | 748 |
| Observed rainfall (mm) | 267 | 198 | 142 | 114 | 81 |

b) Explain Area-velocity method of discharge measurement. **[3]**

OR

**Q2)** a) Explain construction and application of DAD curves with sketch. **[3]**

b) The rates of rainfall for successive 20 minutes period of a 140 minutes duration storms are 2.5, 2.5, 10.0, 7.5, 1.25 and 5.0 cm/hr. Taking the value of '$\phi$' index as 3.2 cm/hr, estimate the net Run-off (surface). Also determine 'W'- index. **[4]**

**Q3)** a) Explain various methods of assessment of canal revenue. State constraints of each. **[3]**

b) Determine reservoir capacity for command area of 40,000 hectares, canal losses = 10%, and reservoir losses = 10%. **[4]**

*P.T.O.*

| Crop | Base period (days) | Duty ha/cumecs | Intensity of irrigation (%) |
|------|------|------|------|
| Sugar cane | 360 | 1700 | 20 |
| Cotton | 180 | 1500 | 10 |
| Wheat | 120 | 1800 | 20 |
| Rice | 120 | 700 | 15 |
| Vegetables | 120 | 700 | 15 |

OR

*Q4)* a) After how many days you will supply water to soil in order to ensure sufficient irrigation of given crop, if field capacity of the soil = 30% permanent wilting point = 12%, density of soil = 1.25 gm/cc, effective depth of root zone = 60 cm and daily consumptive use of water for crop = 12.5 cm. Assume that readily available moisture is 80% of the available water. **[3]**

b) State principal Indian crops and explain importance of crop rotation. **[4]**

*Q5)* a) A 20 cm well penetrates 30m below static water level (GWT). After long period of pumping at a rate 1800 rpm, the drawdown in the observation wells are 12m and 36m from the pumped well are 1.2m and 0.5m respectively. **[4]**

Determine :

i) transmissibility of the aquifer.

ii) drawdown in the pumped well assuming R = 300 m.

b) Explain the perched water table. **[2]**

OR

*Q6)* a) Write explanatory note - Validity of Darcy's law. **[2]**

b) Derive the Dupit's equation for unconfined aquifers. State assumptions. **[4]**

*Q7)* a) The ordinate of 4-hour unit hydrograph in particular basin are given below. Determine the ordinate of the S-hydrograph and also the ordinate of 6-hour unit hydrograph. **[8]**

| Time (Hrs) | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4-hour unit Hydrograph ordinate (cumecs) | 0 | 25 | 100 | 160 | 190 | 170 | 110 | 70 | 30 | 20 | 6 | 1.5 | 0 |

b) What are different methods of estimation of flood. Explain any one. **[8]**

OR

*Q8)* a) Define 'Recurrence internal' and 'frequency' as applied to annual floods. Explain Gumbel's method. **[8]**

b) What is "S" curve hydrograph? Explain its component and construction with a sketch. **[8]**

*Q9)* a) Explain flow mass curve and explain the step by step procedure to determine the reservoir capacity and surplus water. **[8]**

b) What are different looses which take place from reservoir. Also write methods to control it. **[8]**

OR

*Q10)* a) Explain Fixation of reservoir capacity using elevation capacity curve and dependable yield. **[8]**

b) What is Flood routing? State different methods. Explain any one in detail. **[8]**

*Q11)* a) Explain rotational water supply system. **[6]**

b) Describe the role of auto weather station in water management. **[6]**

c) What are causes of becoming land alkaline and saline. Suggest remedies. **[6]**

OR

*Q12)* a) Explain water logging - process, causes and curative measures. **[6]**

b) What is PIM? Why is it needed in India. **[6]**

c) Compare 'Warabandi' with cooperative water distribution system. **[6]**

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