

B.Tech III Year I Semester (R13) Supplementary Examinations June 2017

**WATER RESOURCES ENGINEERING – I**

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

**PART – A**  
(Compulsory Question)

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- 1 Answer the following: (10 X 02 = 20 Marks)
- Define hydrology and list the applications of engineering hydrology.
  - What factors influence runoff and its volume? Briefly describe them.
  - What is a synthetic hydrograph and how can you derive it?
  - Compare shallow wells with deep wells.
  - Enumerate the functions of irrigation water in raising crops.
  - What are the various resources of irrigation water?
  - Define Balancing depth and derive a relation for its determination.
  - Give the criterion for selecting the following: (i) Bank width. (ii) Inspection roadway.
  - Explain the terms piping failure and exit gradient.
  - What assumptions were made by Bligh in his creep theory?

**PART – B**  
(Answer all five units, 5 X 10 = 50 Marks)**UNIT – I**

- 2 (a) Discuss the advantage and disadvantages of recording type rain-gauges.  
(b) Derive a correlation equation between runoff and rainfall for a catchment with the following observation:

Precipitation P for 18 months in mm	100	300	450	250	200	50	100	260	410	250	150	30	70	170	350	200	130	30
Runoff in mm	10	95	143	77	36	27	6	115	165	75	28	11	5	60	99	71	20	0

OR

- 3 (a) How can you check the adequacy of existing rain gauges?  
(b) A catchment area has seven rain gauges stations. The annual rainfall recorded by the gauges were 1200, 1420, 1180, 1085, 1650, 1020 and 1500 mm. For a 5 percent error in the estimation of the mean rainfall, calculate the minimum number of additional rain gauge stations required in the catchment.

**UNIT – II**

- 4 (a) Explain the following methods used for developing a unit hydrograph of different durations:  
(i) Method of superposition. (ii) S- curve method.  
(b) During a recuperation test, the water level in an open well was depressed by pumping by 3.0 m and it recuperated to 2.0 m in 90 minutes.  
(i) Determine the yield from a well of 5.0 m diameter under a depression head of 3.5 m.  
(ii) Also find out the diameter of the well to yield 12 liters/second under a depression of 2.5 m.

OR

- 5 (a) Define unit hydrograph. On what concept is it based and what are the assumptions made to derive it.  
(b) Write short notes on the following:  
(i) Pervious lined wells.  
(ii) Unlined wells.  
(iii) Impervious lined wells.

**UNIT – III**

- 6 Explain the following terms:  
(i) Delta. (ii) Base period. (iii) Frequency of irrigation. (iv) Paleo. (v) Kor depth.

**OR**

- 7 (a) Derive a formula for determining the time required to cover a given area of the strip.  
(b) Determine: (i) The time required to irrigate an area of 0.7 hectares. (ii) The maximum area that can be irrigated from a tube-well with a discharge of  $0.035 \text{ m}^3/\text{s}$ . The infiltration capacity of the soil may be taken as 50 mm/hour and the average depth of flow of water as 150 mm.

**UNIT – IV**

- 8 (a) Draw typical cross-section of an unlined canal:  
(i) In cutting.  
(ii) In filling.  
(iii) In partial cutting and partial filling.  
Explain the functions of each component.  
(b) Design an irrigation channel in non-alluvium soil to carry a discharge of  $7 \text{ m}^3$  with a velocity of 0.7 m/s. Assume side slopes  $\frac{1}{2}:1$ , bed slope 1 in 4444 and Manning's  $N = 0.0225$ .

**OR**

- 9 (a) Write the short notes on the following:  
(i) Spoil banks.  
(ii) Land width.  
(iii) Hydraulic gradient line in canals.  
(b) Give the anti-water logging measures for the following:  
(i) Poor water management in the irrigated area.  
(ii) Seepage from canals and water courses.

**UNIT – V**

- 10 (a) State the essential features of Khosla's theory of seepage flow underneath weir. How does it differ from Bligh's theory?  
(b) What do you understand by the terms elementary profiles and practical profile.  
(c) Explain the Khosla's method of independent variables.

**OR**

- 11 (a) Explain the Bligh's design criteria for safety against:  
(i) Undermining. (ii) Uplift pressures.  
(b) Give the draw-backs of Bligh's creep theory.

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