Seat No.	

T.E. (Civil) EXAMINATION, 2014

HYDROLOGY AND WATER RESOURCES ENGINEERING

(2008 PATTERN)

Time : Three Hours   **Maximum Marks : 100**

N.B. :— (i) Answer *three* questions from Section I and *three* questions from Section II.

(ii) Answers to the two Sections should be written in separate answer-books.

(iii) Figures to the right indicate full marks.

(iv) Draw neat diagrams wherever necessary.

(v) Use of calculators is allowed.

(vi) Assume suitable data, if necessary.

SECTION I

1. (a) What are different types of rain gauges ? Explain non-recording type rain gauge with neat sketch.   [6]

(b) Discuss any *two* factors affecting evaporation of water from reservoir.   [4]

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(c) The normal annual depths recorded at five rain gauge stations A, B, C, D and E respectively are 910, 1070, 1410, 810 and 590 mm respectively. Determine the optimum number of rain gauge stations to be established in the drainage basin if it is desired to limit the error in the mean value of rainfall to 10%. What is the percent accuracy of the existing network in the establishment of the average depth of rainfall over the basin ? [8]

Or

2. (a) Differentiate between hyetograph and hydrograph. [4]

(b) Explain the method for plotting depth-area-duration (DAD) curves. State its use in water resources engineering. [6]

(c) The shape of the catchment approximately resembles a square of side 8 km. With reference to an x-y coordinate frame whose origin is coinciding with one of the corners of the catchment, the locations of the four corners of the catchment are (0, 0), (8, 0), (8, 8), (0, 8). There are four rain gauges A, B, C and D within this catchment whose positions with reference to the same coordinate frame are (2, 2), (6, 2), (6, 6) and (2, 6) resectively. The rainfall recorded by the rain guages A, B, C and D during the storm are 8, 6, 9 and 11 cm respectively. Determine the average depths of rainfall over the catchment by arithmetic mean and Thiessen methods. [8]

3. (a) What is hydrograph ? Draw a single peaked hydrograph showing its all components. Also state uses of hydrograph. [6]

(b) Find the ordinates of flood hydrograph resulting from a storm with rainfalls of 3.0, 6.5 and 4.5 cm each during successive 4-hours. The ordinates of a 4-hour unit hydrograph are given below : [10]

Time (hours)	UHO (m^3/s)
0	0
4	110
8	320
12	515
16	380
20	305
24	250
28	230
32	150
36	95
40	50
44	0

3

4. (*a*) What do you mean by base flow ? Enlist the methods of base flow separation and explain any *two* in detail. [8]

(*b*) The observed annual flood peaks of a stream for a period of 40 years from 1942 to 1981 in m^3/s are given below :

395, 619, 766, 422, 282, 990, 705, 528, 520, 436,

697, 624, 496, 589, 598, 359, 686, 726, 527, 310,

408, 721, 814, 459, 440, 632, 343, 634, 464, 373,

289, 371, 522, 342, 446, 366, 699, 560, 450, 610.

Construct the probability plot for the annual flood on ordinary graph. Determine the flood magnitude with return period of 100 years. [8]

5. (*a*) State different parameters considered for selection of site for reservoir. [8]

(*b*) With the help of neat sketch, explain concept and significance of mass curve. [8]

6. (*a*) What is reservoir sedimentation ? State any *four* measures to be adopted to control the reservoir sedimentation. [8]

(*b*) Explain the concept and significance of flood routing. [8]

SECTION II

7. (*a*) State and explain classification of irrigation soils on the basis of physical and chemical properties. [6]

(*b*) Derive the relation between duty and delta. [4]

(*c*) Wheat is cultivated on 6 ha area ? If duty of wheat is 900 ha/cumec and the lowest water level in well supplying the water to plain field of wheat is 7 m from ground level, find minimum power of pump. Consider pump efficiency = 60%. [6]

8. (*a*) What is assessment of canal revenue ? Why is the assessment of canal revenue done ? [6]

(b) State any *six* parameters governing quality of irrigation water. [6]

(c) Explain at least *four* measures to improve duty of water. [4]

9. (a) State Darcy's law. What are its assumptions ? State its validity. [6]

(b) Define the following terms : [4]

(i) Porosity

(ii) Specific yield

(iii) Specific retention

(iv) Transmissivity.

(c) In a water table aquifer of 50 m thickness, a 20 cm diameter well is pumped at uniform rate of 0.05 m^3/s. If the steady state drawdown measured in the observation wells located at 10 m and 100 m distance from the well are 6.5 m and 0.25 m respectively, determine the hydraulic conductivity of the aquifer. [8]

Or

10. (a) Derive the expression for discharge of well in a homogeneous unconfined aquifer assuming equilibrium flow conditions. Draw a neat sketch to assist your answer. [8]

(b) Explain pumping out test and recuperation test and derive the expression for determining specific yield of a well. Draw a neat sketch to assist your answer. [10]

11. (a) Derive the equation for spacing of tile drains to prove
$$L = 4K(b^2 - a^2)/Q_D.$$ [8]

(b) Explain the following : [8]

(i) Efflorescence

(ii) Reclamation of land

(iii) Salinity

(iv) Herringbone pattern.

Or

12. (a) State design parameters of lift irrigation scheme. [8]

(b) State objectives of water management. Explain Sir Visvesvaraya's block system of water distribution with the help of sketch. [8]