AGRICULTURAL ENGINEERING
Paper – I

Time Allowed : **Three** Hours

Maximum Marks : **200**

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions :

There are **EIGHT** questions in all, out of which **FIVE** are to be attempted.

Questions no. **1** and **5** are **compulsory**. Out of the remaining **SIX** questions, **THREE** are to be attempted selecting at least **ONE** question from each of the two Sections A and B.

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it.

Answers must be written in **ENGLISH** only.

Unless otherwise mentioned, symbols and notations have their usual standard meanings. Assume suitable data, if necessary and indicate the same clearly.

Neat sketches may be drawn, wherever required.

SECTION A

Q1. Answer the following : 8×5=40

(a) What are the different types of runoff ? Explain the factors that affect the runoff in a watershed. 8

(b) What do you understand by biological or vegetative measures in a watershed ? Describe the measures. 8

(c) What is integrated watershed management approach ? Explain its different objectives. 8

(d) Define hydrological drought. Write its components and their possible effects. List the measures that can be adopted to lessen the effects of drought in a region. 8

(e) Define remote sensing. What are the different stages in remote sensing data acquisition and processing ? Diagram showing remote sensing system for resource management from source to end use may be given. 8

Q2. (a) What is GIS ? Name the applications of remote sensing and GIS in land and water management. Briefly discuss any three applications. 10

(b) Discuss the Rational method of predicting design peak runoff rate.

In a watershed the most remote point is 600 m away from the outlet point. The outlet point is 3·0 m below the most remote point. Calculate the time of concentration of watershed. 10

(c) Explain a procedure for checking rainfall data of a station for consistency. 10

(d) What is contour trench ? Write about different types of contour trenches. Explain design procedure of contour trench systems. 10

Q3. (a) The ordinates of the 2-h unit hydrograph of a watershed are given below :

Time, h	0	2	4	6	8	10	12	14	16	18	20	22
2-h UH ordinates, m³/s	0	20	90	150	180	160	100	60	25	15	5	0

Determine the ordinates of S-curve hydrograph and using S-curve determine the ordinates of the 4-h unit hydrograph of watershed. 10

(b) What are the factors which affect soil erosion by water ? Discuss. If the degree of slope is increased 4 times, what will be the relative increase in erosion caused by water ? *10*

(c) Define flood routing. Discuss the basic elements of flood routing. *10*

(d) Discuss design procedure of permanent soil conservation structures. *10*

Q4. (a) Describe the classification of bench terraces given by Rama Rao and Bali, with suitable sketches. *10*

(b) What are the factors affecting land grading ? How is survey carried out for land grading ? Discuss commonly used methods for calculation of earth work. *10*

(c) Discuss in brief the utility of farm ponds. What are the different types of ponds depending upon the source of water and their location with respect to land surface ? Write the criteria for selection of site of farm ponds. *10*

(d) What are the different types of soil movement due to wind erosion ? Describe how the movements of the particles of various sizes take place in different types of movement. *10*

SECTION B

Q5. **(a)** What are the different sources of irrigation in India ? List different factors influencing planning and development of minor irrigation projects. What are the positive and negative impacts of irrigation on the ecosystem and environment ? *8*

(b) Differentiate between the following : *4×2=8*

(i) Specific capacity of well and Specific yield of aquifer

(ii) Open wells and Tubewells

(iii) Pumping test and Recuperation test of a well

(iv) Confined and Unconfined aquifers

(c) Discuss various factors influencing irrigation water requirement. How can you estimate total irrigation water requirement incorporating different components for a given field and crop ? *8*

(d) The soil moisture at Field Capacity (FC) is 25% (W/W) and the moisture content at the time of irrigating is 15% (W/W). The apparent specific gravity is 1·52 and depth of soil to be wetted is 90 cm. How much water in ha-cm per hectare must be applied ? *8*

(e) What is Parshall flume ? Explain the working procedure of Parshall flume. How is it different from cut-throat flume ? *8*

Q6. **(a)** Explain the concept of conjunctive use of surface and groundwater in canal command areas for efficient water use. What are the advantages and limitations of conjunctive use ? *10*

(b) What is the importance of drainage network in canal command and large irrigation projects ? List all the information required for design and installation of subsurface drainage systems. *10*

(c) A field of wheat crop of size 200 × 100 m with water source located at the lower left corner in the field is to be irrigated using sprinkler irrigation system. The prevailing land slope is south to north. Draw a layout of sprinkler mainline and lateral lines with brief explanation. *10*

(d) It is very important for a farmstead to be properly arranged. List and explain in brief, the factors to be considered for best arrangement of farmstead. *10*

Q7. (a) List different soil water coefficients. Explain the methodology to estimate maximum available soil water using these coefficients. *10*

(b) A tubewell is established in an artesian aquifer. Find its yield in litres per hour for a drawdown of 3 m when the diameter of the well is 20 cm and the thickness of the aquifer is 30 m. Assume the coefficient of permeability to be 35 m/day. If the diameter of the well is doubled, find the increase in the yield, the other conditions remaining the same. Assume the radius of influence as 300 m in both cases. *10*

(c) What is crop coefficient and how is it estimated using crop evapotranspiration and reference evapotranspiration ? Explain briefly the factors influencing crop coefficient. *10*

(d) Irrigation scheduling involves determining "when to irrigate" and "how much to irrigate". Explain the factors to be considered in developing irrigation schedule, with an example. *10*

Q8. (a) What are the main components of Polyhouse ? Discuss various factors influencing the design and installation of Polyhouses in India for surface covered cultivation. *10*

(b) What are the priorities given to environmental issues in irrigated commands ? Considering a holistic view of irrigated agriculture and socio-economic constraints, explain the issues in brief. *10*

(c) In an exercise to develop design and operations plan for surface irrigation in wheat crop, an infiltration test was carried out. The following data were obtained from the test :

Time from starting (min)	0	1	2	5	10	20	30	60	90	120
Depth of water level from reference (mm)	0	3	5	9	14	18	20	24	28	32

Plot the infiltration rate vs time and find out basic infiltration rate. *10*

(d) What are the different methods for fertilizer injection (fertigation) ? The location of fertigation systems is very important in drip irrigation systems. Discuss in brief. *10*