

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, m ³ /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

