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.

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.

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

SECTION A

Q1. (a) Describe guiding principles for watershed development projects as stipulated in the common guidelines. *8*

(b) What are sand dunes ? Describe the procedure for fixing the sand dunes. *8*

(c) Describe isohyetal method of estimating average rainfall depth over an area. Also write the advantages of it over arithmetic mean method. *8*

(d) (i) What do you understand by the word LANDSAT in image processing ?

(ii) What are the seasonal influences on images ? *8*

(e) Remote sensing (image interpretation) has been used for archaeological investigations. Explain with example. *8*

Q2. (a) Discuss soil conservation farming practices recommended for lands under land use capability classification Class II. *15*

(b) What is a unit hydrograph ? Write the uses and limitations of unit hydrograph. Explain the method for development of unit hydrographs of different durations by S-curve. *15*

(c) Calculate the design dimensions of a contour bund in a medium deep soil having an average slope of 3%. The maximum expected rainfall during a 10-year recurrence is 20 cm. The infiltration capacity of the soil in the area is such that 30 percent of the rain infiltrates into the soil. The horizontal interval between bunds is 60 m. Assume slope of seepage line to be 4 : 1 and side slope of bund to be 1·5 : 1. *10*

Q3. (a) What is a check dam ? Write the uses of check dams. Explain planning and design procedure of check dams. *15*

(b) Explain how the following are determined in plane method of land levelling design : *15*

(i) Centroid of the field

(ii) Slope of the plane of best fit

(iii) Formation levels, cuts and fills

(c) A 200 m long graded bund is laid out at a slope of 0·4%. The height of the graded bund having trapezoidal channel was measured to be 45 cm. The bottom width of the channel was 2 m and the side slopes were 5 : 1 each.

(i) Determine maximum runoff for which the channel was designed. The free board is 15 cm.

(ii) Had the channel been triangular with the same side slope, what would have been the ridge height to discharge the same discharge ? Assume n = 0·04. *10*

Q4. (a) What are the factors that influence interpretation of the remote sensing images ? Discuss different elements of air photo interpretation. *20*

(b) What are the differences between NASA satellite pictures and those of geostationary weather satellite ? *10*

(c) For a stereo pair of figures, Vertical Exaggeration (VE) results because the perceived vertical scale is larger than the horizontal scale. Find the approximate amount of exaggeration for a case of stereo pair of figures in which air base is found to be 2000 m, height of the camera above terrain is 4000 m, apparent stereoscopic viewing distance is 50 cm, eye base for average adult is 7 cm.

Interpret your findings. *10*

SECTION B

Q5. (a) Enlist the steps involved in design of drip irrigation system. *8*

(b) Discuss the different types of aquifers. *8*

(c) In a tile drainage system, drains are to be installed at impervious layer at the depth of 2·0 m below the ground surface. The hydraulic conductivity of the soil is 1·8 m/day. The average rate of recharge is 0·2 cm/day. Calculate the required spacing of the drains if water table is to be kept at 1·0 m from the ground surface. *8*

(d) What would be the storage structure for grains ? *8*

(e) How can you take care of drainage and sewage management ? *8*

Q6. (a) Explain the different approaches for irrigation scheduling. *15*

(b) How is conjunctive use of surface and groundwater vital in the integrated water resource development ? *15*

(c) Discuss mole drainage. *10*

Q7. (a) (i) Describe the water conveyance efficiency, water application efficiency, water storage efficiency and water distribution efficiency. *10*

(ii) A one-hectare farm needs to be irrigated with a depth of 100 mm, if the percolation losses are 30%. What will be the amount of water required for irrigation ? *5*

(b) Describe in brief the reclamation of salt affected soils. *15*

(c) Distinguish between economic feasibility and financial feasibility of irrigation systems. *10*

Q8. (a) Explain the causes by which losses of grain occur during storage. Discuss about humidity to be maintained in the storage system. How can you control the losses ? *15*

(b) Write short notes on the properties of the common building materials used in construction : *15*

(i) Timber

(ii) Brick

(iii) Stone

(iv) Tiles

(v) Concrete

(c) In your view, how should the design and construction of farm roadways be done ? *10*