D–GT–M–BFA

AGRICULTURAL ENGINEERING

Paper—I

Time Allowed : Three Hours | Maximum Marks : 200

INSTRUCTIONS

Candidates should attempt questions 1 and 5
*which are compulsory, and any **THREE** of the*
remaining questions, selecting at least
***ONE** question from each Section.*

All questions carry equal marks.

Marks allotted to parts of a question are
indicated against each.

Answers must be written in ENGLISH only.

Assume suitable data, if necessary, and indicate
the same clearly.

Neat sketches may be drawn, wherever required.

Important Note :—

All parts/sub-parts of a question must be answered
contiguously. That is, where a question is being
attempted, all its constituent parts/sub-parts must be
attempted before moving on to the next question.

Pages left blank, if any, in the answer-book(s) are to
be clearly struck out. Answers that follow pages left
blank may not be given credit.

SECTION—A

1. Answer the following, keeping your answers brief and to the point :—   5×8=40

   (a) What is surplussing arrangement in the design of contour bunds ? Write its need and suggest the suitable location in the bund. Also list different types of outlets used in contour bunding.

   (b) How do you classify bench terraces ? Highlight their salient features with neat sketches.

   (c) Briefly describe various methods of reducing surface wind velocities in wind erosion control.

   (d) List out the procedure for design of a grassed waterway.

   (e) Bring out the applicability of GIS in planning and development of watershed.

2. (a) Describe Universal soil loss equation (USLE) and discuss its different factors.   10

   (b) What is gully erosion ? Write different stages of gully development. Discuss classification of gullies.   10

   (c) Design a system of retards for a stream 15 m wide where the channel makes a 35° turn on 8° curves. Also discuss the method.   10

(Contd.)

(d) Discuss working of Coshocton type runoff samplers. How will you design storage tank for Coshocton type runoff sampler ? Also discuss limitation of the method. **10**

3. (a) Write difference between :—

    (i) Gully erosion and stream channel erosion

    (ii) Wind break and shelter belt

    (iii) Diversions and waterways

    (iv) Contour strip cropping and field strip cropping. **10**

    (b) With the help of neat sketch, describe purposes of various structural components of a drop spillway. **10**

    (c) Explain a procedure for supplementing the missing rainfall data. **10**

    (d) Discuss the importance of people's participation in watershed development. **10**

4. (a) Discuss the various elements used in object recognition in photo interpretation. **10**

    (b) What data would you like to include in a watershed planning report on a recommended management programme ? Explain. **10**

(c) How will you check stability of Soil Conservation structures against following causes of failures ?

    (i)   Sliding

    (ii)   Shear Friction

    (iii) Overturning and

    (iv) Tensile stresses.   10

(d) How is the water requirement of a farm pond determined ? Explain.   10

SECTION—B

5. Answer the following, keeping your answers brief and to the point :—   5×8=40

(a) Highlight different methods of surface drainage with the help of suitable diagrams.

(b) What is cavitation ?

(c) What do you understand by current meter ? Name two main types of current meters and explain one of them.

(d) What is leaching requirement of a land ? How is it determined ?

(e) Explain reclamation measures for alkali soils.

6. (a) Explain direct methods of evapo-transpiration measurement. 10

(b) Explain different types of weir used for measuring water on farms. What precautions are necessary to ensure reliable results in measurement ? 10

(c) Discharge of a tube well is 40 lit/sec. It irrigates 1.2 ha area in 16 hrs. Water is available at the plot at the rate of 35 lit/sec. The depth of root zone of crop is 1.2 m and loss of water in the plot is 150 m^3. Water holding capacity of the soil is 20 cm/m. 50% of available moisture was available in the plot before irrigation. Calculate water conveyance, water application and water storage efficiency. 10

(d) What do you understand by border irrigation method ? Under what conditions is this method chosen ? Also write its advantages. 10

7. (a) What discharge can be expected from an unconfined well having diameter as 3.0 meters ? The drawdown in the well is 8.0 m and the aquifer is saturated to a depth of 15.0 meters. The coefficient of permeability of the aquifer material is 5 meter per day and the radius of influence is 150 meters. 10

(Contd.)

(b) Explain design procedure of a drip irrigation system. Write the advantages and disadvantages of drip irrigation system.　　...　　10

(c) How will you determine following properties of saline and alkali soils ?

(i) Ph

(ii) Soluble salts

(iii) Gypsum requirement.　　　10

(d) An earthen channel is laid on a grade of 0.15% with bottom width of 60 cm and side slope 1 : 1. The depth of flow of water is 1.2 m. Calculate the velocity of flow and carrying capacity of channel assuming Manning's roughness coefficient as 0.04.　　10

8. (a) Water from a tube well is flowing over a rectangular weir. The width of crest of the weir is 120 cm and depth of water flowing over the crest is 36 cm. The stream of water is diverted into a field of 1 ha. The depth of irrigation is 7.5 cm. Calculate the time required to irrigate the field.　　10

(Contd.)

(b) Describe the reasons for the following troubles of centrifugal pumps and how these can be rectified.

    (1) Pump fails to prime

    (2) Pump fails to develop sufficient pressure or capacity.   10

(c) What is farm stead ? What factors govern the location of the farm stead on the farm ?   10

(d) What are the requirements of good storage structures on farms ? Describe.   10