

AGRICULTURE 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.

Question 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 chronological 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 answer book 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 other-wise 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

Q.1. Answer each of the following :

- Q. 1(a) What do you understand by unit hydrograph ? Explain how to develop a unit hydrograph from a single peak runoff hydrograph. 8
- Q. 1(b) In and around a watershed there are 6 numbers of rain gauges. Average rainfall is to be determined for estimation of runoff average. Discuss Thiessen polygon method of averaging rainfall. 8
- Q. 1(c) Explain the process of estimating missing rainfall data and adjustment of records for missing stations by double mass analysis method. 8
- Q. 1(d) Discuss Isohyetal method of determining mean rainfall over a watershed. 8
- Q. 1(e) In a forest area, necessity for a small reservoir was felt for maintaining proper soil moisture regime. For this purpose a seasonal stream was selected for construction of a small dam across it. But runoff data at the point was necessary for determining reservoir size and out-flow structure. The depth of flow in the stream is roughly 4 to 5 m after a good rain in its catchment. You were to use a current meter. Explain step-by-step how you will proceed for your duty. 8

- Q. 2(a) Following are the data of unit hydrograph for a rainfall duration of 3 hr storm. Using "S" curve techniques develop a unit hydrograph of 6 hr rainfall. 10

Time (hr)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UH (m ³ /sec)	0.0	0.5	1.0	1.4	1.8	2.0	1.9	1.5	1.2	0.9	0.7	0.4	0.3	0.2	0.1	0.0

- Q. 2(b) Discuss gulley erosion, its formation and different stages of its formation. 10
- Q. 2(c) Discuss raindrop erosion, the factors influencing it and the process. 10
- Q. 2(d) You are given the responsibility of determination of soil loss from a field observation. It was decided to install 'Coshocton wheel silt sampler'. Discuss how to proceed step-by-step. 10
- Q. 3(a) Sketch and discuss design and construction of a sand fill poly-bag structure to stabilize a gulley. 10
- Q. 3(b) Differentiate between contour strip cropping, field strip cropping and buffer-strip cropping for assisting soil and water in a cultivated field. 10
- Q. 3(c) Sketch a drop inlet spillway across an earthen dam. Name its components and discuss their functions. 10
- Q. 3(d) Derive the equation for critical depth in a rectangular channel using specific energy head at a section with reference to channel bed. 10
- Q. 4(a) Explain the most important informations available in Survey of India Toposheet for the development of watershed. 10
- Q. 4(b) Explain how aerial photography and remote sensing are useful for watershed development. 10
- Q. 4(c) A watershed map is to be prepared for a stream whose major part of its catchment falls under dense forest area. Aerial photographs of the area are available. Explain the technique how you are going to use them. 10
- Q. 4(d) What do you mean by flood routing ? Discuss its advantages in design of a reservoir spillway. 10

SECTION—B

- Q.5. Answer the following, not exceeding 150 words for each answer :

- Q. 5(a) Discuss in brief the causes and reclamation of Saline and Alkaline soils. 8
- Q. 5(b) Classify different types of wells. Explain under what condition you will recommend for use of following :
- (i) Centrifugal pump
- (ii) Submersible pump. 8

- Q. 5(c) State the various water measuring devices. Briefly discuss the use and construction of the following :
- (i) Parshall Flumes and H-Flumes
 - (ii) Cup type current meter. 8
- Q. 5(d) State the types of Road patterns, that can be adopted in planning a Road System. Explain in detail the construction of general roads. 8
- Q. 5(e) Briefly discuss the advantages and limitations of use of Sprinkler irrigation over Surface irrigation methods. 8
- Q. 6(a) Distinguish between the following :
- (i) Trickle Irrigation and Drip Irrigation
 - (ii) Phreatic Head and Piezometric Head
 - (iii) Critical period and Evapotranspiration
 - (iv) Venturi Meters and Elbo Meters. 10
- Q. 6(b) A pre-fabricated concrete channel section used for lining irrigation channel has the following specifications :
- Bottom width = 17.5 cm
- Top width = 20 cm
- Height = 17.5 cm
- Calculate the carrying capacity of the section when the channel slope is 0.25%. Take Manning's $n = 0.06$. 10
- Q. 6(c) Write short notes on :
- (i) Bulk storage structures
 - (ii) Irrigation measurement structures for various flows in earthen channels. 10
- Q. 6(d) Describe the application of fertilizers and chemicals to crops through pressurised irrigation systems (Both sprinkler and drip irrigation). 10
- Q. 7(a) Design an open Drainage to drain 550 hectares of land having drainage co-efficient of 2.5 cm. The soil is silt-loam and maximum permissible slope of the channel bed is 0.1 percent and side slopes 1.5 : 1. Assuming $d = 1.2$ m, considering the requirements of Free board, decide the suitable section. Take roughness co-efficient as 0.04. 10
- Q. 7(b) Explain Franci's formula and compute the discharge of rectangular weirs 45 cm long with a head of 12 cm, under following conditions :
- (i) with no end-contractions
 - (ii) with two end-contractions. 10

- Q. 7(c) Discuss briefly the constructional features of Gable Green Houses and Quonset Green Houses for growing Horticultural crops. 10
- Q. 7(d) Explain the advantages of Deep Litter Poultry Houses in comparison to Cage Houses. 10
- Q. 8(a) Calculate the cost of fencing a rectangular field of 150 Acres of forest land having sides 5 : 3 ratio, using angle iron posts and barbed wire and no. of stands is 4. Assume other necessary data and state them clearly. 10
- Q. 8(b) Discuss the procedure for estimating evapotranspiration based on climatological approach by using Blaney-Criddle method. 10
- Q. 8(c) Design a trench silo for a Small Farm, housing the following herd. The silage is fed 160 days in a year at the rate of 3.4 kg per 100 kg of animal body weight as detailed below :

Animal Breed	Body weight per animal (kg)	Total number of animals	Rate of feeding per 100 kg of body weight (kg)
Murrah Buffaloes	680	40	4.0
Haryana Cows	450	60	3.0
Bullocks	500	20	3.5
Heifers	180	20	3.0

The depth of the silo = 2.5 m; length of silage fed per day = 15 cm; side slope—50 percent. Make reasonable assumptions if necessary with clear statement. 10

- Q. 8(d) Briefly discuss the functional aspects and structural aspects in design of concrete grain bin. 10