

AGRICULTURAL ENGINEERING

Paper – II

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.** (a) Discuss the different sources of farm power available in India. What are their merits and demerits ? 8
- (b) Describe in brief : 8
- (i) Why do rear wheels of general purpose tractors have tyre inflation pressure less than the front wheels ?
 - (ii) Why is a differential lock provided in a tractor ?
 - (iii) Why do tractors have independent brake pedals ?
 - (iv) Why are drive wheel tyres provided with lugs in general purpose tractors ?
- (c) Differentiate between the following in brief : 8
- (i) Single action and Double action disc harrow
 - (ii) Throughput and Axial Flow threshers
 - (iii) Solid cone and Hollow cone nozzles
 - (iv) Seed-cum-fertilizer drill and Horizontal plate planter
- (d) Distinguish between the following in brief : 8
- (i) Biogas and Producer Gas
 - (ii) Compressed Natural Gas and Compressed Biogas
 - (iii) AC Motor and DC Motor
 - (iv) Solar Cell and Dry Cell
- (e) List the factors affecting the following : 8
- (i) Biogas production from cattle manure
 - (ii) Producer gas production from agricultural crop residues
 - (iii) Draft requirement of a tractor drawn mouldboard plough
 - (iv) Grain losses in a power thresher
- Q2.** (a) Define the following terms : 20
- (i) Top Dead Centre
 - (ii) Engine Displacement Volume
 - (iii) Tappet Clearance
 - (iv) Tilt Angle of a Standard Disc Plough
 - (v) Field Performance Index
 - (vi) Salvage Value of a Machine
 - (vii) Total Solids
 - (viii) Volatile Solids
 - (ix) Hydraulic Retention Time
 - (x) Solar Time

- (b) Name the different components required in a Solar PV system for household application and describe the function of each component. 10
- (c) Find the peripheral force on the lever of a prony brake dynamometer and the bhp of the prime mover running at 755 rev/min. The length of the lever of dynamometer is 1.43 m. The weight on the pan of balance measures 39.9 kg and tare is 7.5 kg. 10
- Q3.** (a) With the help of a suitable block diagram indicate power transmission from engine to drive wheels in a tractor and describe the function of each component of the power train. 15
- (b) What are the different types of sprayers used on agricultural farms ? Explain the functioning of manually operated knapsack sprayer with suitable diagram. 15
- (c) A cattle manure based biogas plant has diameter and height of digester as 2 m and 5 m respectively. The plant is charged daily with 100 kg fresh manure mixing it in equal proportion with water. If the input slurry has density of 1.05 g/cc, calculate the volume of digester of the plant and also the daily biogas production from the plant if 50 l biogas is produced from one kilogram of fresh manure. 10
- Q4.** (a) Explain the different components of battery ignition system of a four-cylinder engine through neat sketch. 10
- (b) Draw a neat figure showing the different components of a Deenbandhu Biogas plant and describe its working. 15
- (c) At what speed will a four-wheel tractor overturn during turning if its weight is 2 tonnes, centre of gravity 1 m ahead of rear axle and 75 cm above the ground, wheel base is 2.20 m and wheel spacing 1.6 m ? The distance between the centre of rotation and centre of gravity is 4 m. 15

SECTION B

- Q5.** (a) Write the different types of post-harvest losses which occur at different stages of unit operations in food grains. Explain any one of them. 8
- (b) Write the advantages of Rice Parboiling. 8
- (c) Define Ice-cream. Write the method/flowchart of manufacturing, packaging, hardening and storage of ice-cream. 8
- (d) Enlist the different types of dryers used for drying agricultural commodities. Explain foam mat drying for liquid juices. 8
- (e) Write about digital computers. Draw digital computer system showing input and output devices. 8
- Q6.** (a) With the help of process flowchart describe the cottage scale food processing industry for production of fruit jams and juices. 15
- (b) How many kg each of 28% cream and 3% milk will be required to make 500 kg of a mixture testing 4% fat ? Also do proof showing fat in individual items. 15
- (c) Briefly describe the following : 10
- (i) Burr mill
- (ii) Turmeric processing
- Q7.** (a) (i) Describe the construction and operation of Recirculatory batch dryer (RPEC type) with neat sketch. 10+5
- (ii) Explain the mini dal/dhal mill for milling of pulses.
- (b) Design a bag storage structure for storing 500 tonnes of wheat. Assume bag size is 70 × 50 × 30 cm to hold 50 kg grain in it. Keep 15 bags in length and 15 bags in width per stack with height/layer of 15 stacks. Assume reasonable data where necessary. 15
- (c) (i) Explain the processing and ginning of cotton.
- (ii) Briefly explain about mechanical oil expeller for production of edible oils. 5+5

- Q8.** (a) What is an amplifier and what are their different types ? With the help of neat sketch, explain the hydraulic amplifying element. 15
- (b) Write in brief about the following : 15
- (i) Transmission Dynamometer
 - (ii) Driving type Dynamometer
 - (iii) Absorption Dynamometer
- (c) For a certain thermistor, $\beta = 3140$ K and the resistance at 27°C is known to be 1050Ω . The thermistor is used for temperature measurement and the resistance is measured as 2330Ω . Find the measured temperature using equation of the temperature-resistance characteristics of the thermistor. 10

