

**CSM – 13/19**

**Agricultural Engineering**

**Paper – II**

*Time : 3 hours*

*Full Marks : 300*

*The figures in the right-hand margin indicate marks.*

*Candidates should attempt Q. No. 1 from Section – A and Q. No. 5 from Section – B which are compulsory and any **three** of the remaining questions, selecting at least **one** from each Section.*

**SECTION – A**

1. Answer any **three** of the following :

(a) What do you mean by **otto cycle** and **diesel cycle** of an IC engine ? Explain each of them with the help of neat sketch diagram giving an expression for thermal efficiency. 20

(b) Describe the different components of a common type carburettor with the help of neat sketch along with its functioning. 20

(c) Explain the constructional difference between floating dome and fixed dome type biogas plants. What are their advantages and disadvantages and which one is more efficient in view of production of biogas. 20

(d) Calculate the time required for sowing 4 ha of land by a five furrow seed drill going 125 mm deep with a speed of 3 kmph. The pressure exerted by the soil on the seed drill is  $0.42 \text{ kg/cm}^2$ . The space between two furrow openers is 100 mm and time loss in turning is about 10%. 20

2. (a) What are different methods of water cooling system of an IC engine ? Describe the advantages and disadvantages of air cooling system over the water cooling system. 20

(b) Explain the working of throttle governing system used in the tractor with the help of neat sketch. What is governor regulation and governor hunting ? 20

- (c) Calculate the size of tractor required to pull a four bottom 350 mm M.B. plough through a depth of 100 mm. The soil resistance is  $0.5 \text{ kg/cm}^2$ . The speed of tractor is 6 kmph, transmission and tractive efficiency of the tractor being 85% and 30% respectively.

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3. (a) How a disc plough differs with mould board plough in principle ? Elaborate their suitability and condition of use along with their advantages and disadvantages. 20
- (b) Elaborate the basic difference between solar flat plate collector and solar concentrator. Under what condition these two are recommended for various uses. 20
- (c) A sunflower planter is required to have a plant population of 55,000 plants / ha at a row to row spacing of 0.6 m and plant to plant spacing of 0.3 m. The diameter of ground wheel is 0.4 m with overall transmission ratio of 0.5. Determine the number of cells on the periphery of metering plate. 20

4. (a) Discuss about luffing arrangement of Bucket Wheel excavator with the help of suitable diagram. Compare rope-winch versus hydraulic system of bucket wheel excavator.

20

- (b) What are the different types of nozzles used in sprayers ? How they differ from each other ? Explain their pattern and suitability.

20

- (c) Calculate the location of C. G. of a tractor using the weighing method with the following data :

- (i) Wheel base – 2.3 m, (ii) Radius of rear wheel – 720 mm, (iii) Radius of front wheel – 360 mm, (iv) Width of rear wheel – 250 mm, (v) Total weight of tractor – 1800 kg, (vi) Weight carried by front wheel on level ground – 630 kg, (vii) Weight carried by front wheel when lifted 460 mm from the ground – 540 kg.

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## SECTION - B

5. Answer any **three** of the following :

(a) What principles are involved in thin layer and deep bed drying of food grain ? Discuss the factors which affect these methods of drying.

20

(b) What do you understand by processing of seeds ? What are the unit operations involved in seed processing? Explain each of them in brief.

20

(c) Determine the quantity of ice required to cool 500 kg of milk at 340 K to 276 K by ice assuming that the specific heat of milk as 0.93 and final temperature of ice water as 274 K.

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(d) Differentiate between sensors and transducers. Classify and explain each of them based on their applications.

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6. (a) Describe the constructional features of **Bukhari and Kothar** storage system with the help of suitable diagram. Explain their merits and demerits in brief.

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- (b) Describe the working principles of Multiple Effect Evaporator through neat sketch. What are its advantages over single effect evaporator? 20
- (c) Describe the different components of a cream separator with the help of neat sketch. Explain its working principles. 20
7. (a) What are the various equipments generally used for size reduction? Explain each of them in brief with the help of suitable sketch. 20
- (b) Define Pasteurization. Explain the working of HTST pasteurizer. Why should the milk be pasteurized? What is regeneration? 20
- (c) Explain the functioning of tunnel dryers through a neat sketch. Discuss its suitability of use for various grains. 20
8. (a) What do you understand by refrigeration system? Describe the working principle of compression refrigeration system with the help of neat sketch. 20

- (b) What do you understand by freeze drying ?  
Explain the functioning of freeze dryer through  
a neat sketch. 20
- (c) Discuss the different types of drawbar  
dynamometers used in the field of agriculture.  
What are the advantages of strain gauge type  
dynamometer over others ? 20



What is the purpose of the study?  
The purpose of the study is to determine the effect of the treatment on the outcome.  
What is the research design?  
The research design is a randomized controlled trial.  
What is the sample size?  
The sample size is 100.  
What is the primary outcome?  
The primary outcome is the rate of infection.