

CSM – 13/17
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 : $20 \times 3 = 60$
 - (a) What do you mean by Otto cycle and Diesel cycle ? Explain with neat diagram giving an expression for thermal efficiency.
 - (b) Explain how the producer gas and biogas is used for running I. C. engines and for electric power generation.

(c) A rear wheel drive tractor with a total weight of 23 kN has a wheel base of 2100 mm and C. G. is 710 mm ahead of rear axle centre line. The tractor is pulling a level drawbar pull of 15 kN on a concrete surface at a forward speed of 6 km/h and the drawbar height is 485 mm. The axle power is 33.3 kW. Determine :

- (i) Weight transfer on rear axle
- (ii) Coefficient of traction
- (iii) Tractive efficiency

(d) A 35 HP tractor costing Rs. 5 lakh is expected to have a useful life of 10 years. Calculate the depreciated value after 5 years, by 3 different methods, assuming the salvage value as 10% of initial cost.

2. (a) Explain the power transmission system of tractor with neat diagram. 20
- (b) Describe the importance and role of human factors in tractor design. 20

- (c) How the primary and secondary tillage equipments differ in field working ? To what an extent they supplement each other ? 20
3. (a) Explain and compare the energy requirements in various agricultural operations. 20
- (b) Explain in what ways the energy from the sun and the wind is reliable for agricultural operations. 20
- (c) Describe the haulage of agricultural and forest produce. 20
4. (a) A 3×22 cm bullock drawn seed drill is being used for sowing wheat crop. The speed of drilling machine is 3 km/h. Seed rate setting is 90 kg/ha. 20
- (i) Calculate the amount of seed falling per minute through each tube.
- (ii) If ground wheel diameter is 30 cm, then calculate the seed rate per revolution of the wheel.
- (iii) Calculate area covered in one day, if field efficiency is 70%.

(b) What are the various functions of scrapers, draglines, bulldozers and power buckets ?

20

(c) Explain the role of electricity in agriculture and agro-industrial applications.

20

SECTION – B

5. Answer any **three** of the following : $20 \times 3 = 60$

(a) Explain the importance of rice processing. Describe the working of a rubber roll sheller.

(b) Describe the working and important features of a seed processing plant.

(c) Explain unit operations in processing of cereals, oil seeds and pulses.

(d) Explain the applications of primary sensors and transducers in agricultural processing.

6. (a) Explain generalized instrumentation system.

20

(b) Write programming of microprocessors and data acquisition and control of agricultural engineering processes.

20

(c) Wheat grain is dried from 15% to 7% (wet basis) by flowing fresh warm air mixed with recycled air over the material in a continuous dryer. The absolute humidity of fresh, recycled and mixed (at the dryer inlet) air stream are 0.01, 0.1 and 0.03 kg/kg respectively. Calculate the flow rates of each air stream (kg of dry air/h), moisture removed and the product flow rate for a feed rate of 100 kg/h. 20

7. (a) Describe the process of flow chart for product manufacturing. 20

(b) Describe the working with details of capacity and power requirement of belt and screw conveyors, bucket elevators. 20

(c) What are the applications of computer techniques in design optimization? 20

8. (a) Explain the working principles of equipments for receiving, pasteurization, sterilization and homogenization. 20

- (b) Describe the waste and by-product utilization of rice husk, rice bran, plant residues and coir pith. 20
- (c) Specify and name the measuring instruments for current, voltage, electrical power flow, pressure, temperature, humidity, strain, force, torque and energy. 20

