CSM – 13/16

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 ***three*** *of the remaining questions, selecting at least* ***one*** *from each Section.*

SECTION – A

1. Answer any **three** of the following : **[20×3 = 60]**

   (a) What is the status of farm mechanization in Odisha as compared to that of the country ? Compare the availability of animate power, mechanical power and electrical power in your state with that of India.

(b) What are the advantages and salient features of zero till seed drill and pneumatic seed drill over the conventional seed drill. What are the advantages of precision seed drill / precision planter ?

(c) Elaborate the procedure of cost estimation of performing field operations by farm machinery. What is break even point (B. E. P.) ? Explain it graphically.

(d) A rear wheel drive tractor with a total weight of 23 kN has a wheel base of 2100mm 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

2. (a) What are the different types of transmission systems used in a tractor engine ? Explain any one of them. **[15]**

(b) Explain the critique of various renewable energy sources. To what an extent, these are reliable in your state ? **[15]**

(c) Describe the energy efficient cooking stoves and alternate cooking fuels. **[15]**

(d) The total draft of a 3-bottom 30cm MB plough, when ploughing 20cm deep at 5km/h was 12 kN. Calculate : **[15]**

(i) Specific draft in N/cm^2.

(ii) What is the actual power requirement ?

(iii) If the field efficiency is 80%, what would be the rate of work in ha/h.

3. (a) Write the name of any 5 tractors, their manufacturers in India along with their specifications. **[15]**

(b) State the different components of carburetor and also explain with neat sketch the spark plug in petrol engine. **[15]**

(c) What is the purpose of dynamometers ? Describe its various types and explain the principles of prony brake dynamometer. 15

(d) An air blast sprayer is to be operated at 3 km/h and the desired application rate is 18 liter per tree. The tree spacing is 9m × 9m. each nozzle delivers 5 liters/min at the operating pressure of 4.0×10^5 N/m^2. If one half row is sprayed from each side of the machine, how many nozzles will be needed ? **[15]**

4. (a) Explain, in brief, various sowing and planting machines. Also, discuss the calibration of Pneumatic seed drill. **[15]**

(b) A 8-row automatic transplanter operates at a forward speed of 0.25m/s. If the seedling spacing along the row is 0.25m and row to row distance is 0.75m, calculate the feed rate of seedling into the planter. **[15]**

(c) Explain the role of earth moving machines in land development works, particularly the use of laser land leveler in rice fields. **[15]**

(d) How bio gas and producer gas is used for running I. C. engines ? [15]

SECTION – B

5. Answer any three of the following : [20×3 = 60]

(a) What do you understand by agricultural by-product and wastes ? Explain the utilization of rice husk and, rice bran.

(b) Describe the various unit operations in paddy processing.

(c) Describe the status of rice milling in your state.

(d) Explain the engineering properties of agricultural produces and by-products, affecting its handling and processing.

6. (a) Explain the working principles of equipments for sterilization and homogenization of milk. [20]

(b) What is Pasteurization ? What are its various types, methods and purpose ? Give operational details of HTST. [20]

(c) Find the amount of moisture to be removed in drying 1 tonne of grain, initially at 24% moisture (wet basis) to 12% moisture (wet basis). Also, calculate the weight of dried grain. **[20]**

7. (a) Name the different grain handling equipments. Explain any one, stating its design consideration, components and operational characteristics. **[20]**

(b) Milk pasteurization is carried out either at 85°C temperature for 4s or at 71°C for 40s. In both the cases the sterilizing value is 8. What are the decimal reduction times for these two processes ? Calculate the Z value for referecne temperatures of 71° C and 85° C. Also obtain the activation energy value for pasteurization process. **[20]**

(c) Explain, in detail, the primary and secondary memory devices. **[20]**

8. (a) Explain, in brief, flow chart, multimedia, computer networks and applications of computer in agricultural processing. **[20]**

(b) What are the different types of sensors / transducers used for measurement of temperature and humidity ? Explain, in brief. [20]

(c) Write brief notes on the following : [20]

(a) Equilibrium moisture content

(b) Food dehydration

(c) Solvent extraction

(d) Blanching

(e) Juice extraction