IFoS 2010

Serial No. 0102 B–JGT–K–BFB

AGRICULTURAL ENGINEERING

Paper—II

Time Allowed : Three Hours *Maximum Marks : 200*

INSTRUCTIONS

Candidates should attempt Question Nos. 1 and 5 which are compulsory, and any THREE of the remaining questions selecting at least ONE question from each Section.

All questions carry equal marks. Marks allotted to each part of a question is indicated against each.

Answers must be written in English only.

Assume suitable data if considered necessary and indicate the same clearly in your answer.

Unless indicated otherwise, symbols, notations and abbreviations have their usual meanings.

SECTION—A

1. Answer any **FOUR** of the following (not exceeding **150** words each) :

   (a) Differentiate between the following :

      (i) Raspbar cylinder and spike tooth cylinder.

(Contd.)

(ii) Hollow cone nozzle and Solid cone nozzle.

(iii) Tilt angle and Disc angle.

(iv) Helical gear and Herringbone gear.

(v) Coefficient of friction and Coefficient of traction. 10

(b) Differentiate between the following :—

(i) Active Solar heating and Passive Solar heating.

(ii) Solar altitude and Solar azimuth.

(iii) Thermochemical conversion and Biochemical conversion.

(iv) Total solids and Volatile solids.

(v) Floating drum and Fixed dome type biogas plants. 10

(c) Discuss the effects of following in brief :—

(i) Higher crop moisture content on cylinder loss from power thresher.

(ii) Tandem wheel arrangement of drive wheels of a tractor on tractive ability. 10

(d) What are the differences between :—

(i) A root plough and a grubber ?

(ii) A carryall scraper and a buckscraper ? 10

(e) List the major differences between :—

(i) Circular saw and Chain saw.

(ii) A blade terracer and a land plane. 10

(Contd.)

2. (a) Write in brief :—

(i) Will there be any side draft occurring during operation of a tandem disc harrow ? If yes, specify reasons.

(ii) Why is the centre of resistance not a fixed point on a mould board plough ? 10

(b) Define the following terms :—

(i) DBHP

(ii) BMEP

(iii) Centre of pull

(iv) Virtual hitch point

(v) Engine displacement volume. 10

(c) Draw neat figures showing arrangement of discs in a single action, tandem and offset disc harrows. Describe how the depth of penetration is controlled in these harrows. 10

(d) Draw neat figures showing different spray patterns obtained using nozzles in agricultural sprayers. Discuss in brief about use of these patterns for application of pesticides. 10

3. (a) Describe in brief :—

(i) Use of a breather in a tractor engine.

(ii) Use of a camshaft in valve system of a tractor engine. 10

(b) A tractor with a total weight of 28·5 kN has a front wheel reaction of 9·0 kN when it is placed on a horizontal surface. The wheel base is 2083 mm. The tractor is pulling a drawbar load of 12 kN. The pull is parallel to the ground and the drawbar height is 580 mm. Calculate the weight transfer. Also discuss the effect of weight transfer on front and rear wheel reactions. 10

(c) A petrol engine working on Otto cycle has a clearance volume of 20% of the stroke volume. The engine consumes 8·17 litres of petrol per hour when developing 32 IHP. The specific gravity of petrol is 0·76 and its calorific value is 10,500 kCal/kg. Determine indicated thermal efficiency of the engine taking K = 1·4 for air. 10

(d) Draw a neat sketch showing details of sliding mesh type gear box having four forward and one reverse speed and explain its working. 10

4. (a) Draw a neat figure showing components of a Deenbandhu type biogas plant. How will you decide its major dimensions if it is to be used to provide biogas to a 5 hp dual-fuel CI engine to be used for five hours daily ? 10

(b) Write short notes on :—

(i) Absorber plates for air collectors.

(ii) Flow paths in liquid type collector arrays. 10

(Contd.)

(c) What are the different unit operations performed in raising potato crop in a totally mechanized farm ? How will you estimate energy requirement in harvesting of potato in such a farm ? 10

(d) Draw a neat figure showing a savonious rotor and arrieus rotor type wind mills. Discuss their merits and demerits. 10

SECTION—B

5. Answer any **FOUR** of the following in not more than **150** words each :—

(a) Differentiate between the following :— 10

(i) Equilibrium moisture content and Equilibrium relative humidity.

(ii) Capacitance and Thermal capacity.

(b) Differentiate between the following :— 10

(i) Linear transducer and Non-linear transducer.

(ii) Deflection mode and Null mode.

(c) Differentiate between a parallel port and USB port and discuss their uses in a PC. 10

(d) Differentiate between :— 10

(i) A burr mill and a hammer mill.

(ii) A disc type huller and a roller type huller.

(e) Write the equations for determining capacity of a belt conveyor, a chain conveyor and a screw conveyor and describe the symbols used. 10

6. (a) Define the following terms :—

(i) Sensitivity

(ii) Hysteresis

(iii) Span

(iv) Calibration

(v) Linearity. 10

(b) Draw a process flow diagram showing the different operations performed in a modern seed processing plant indicating the equipment needed and their selection criteria. 10

(c) Draw a neat sketch of a hydraulic brake dynamometer and describe its working. 10

(d) Draw a neat figure showing a Wheatstone bridge and discuss deflection method and null method of application in the bridge. 10

7. (a) Draw neat figure showing details of mounting of strain gauges for the measurement of tensile, compressive and shear loads. Also discuss selection of gauges for above applications. 10

(b) Discuss the different types of automatic recording mechanisms used in measuring instruments. 10

(c) Briefly discuss the utilisation of sugarcane bagasse in different forms in modern agro-based industries. 10

(Contd.)

(d) List the different components of a seed cleaning machine and discuss the factors affecting performance of a seed cleaner. 10

8. (a) Write short notes on :—

(i) HTST pasteurizer.

(ii) Vacuum type milk bottle filler. 10

(b) Draw a neat schematic diagram indicating various steps in a modern rice mill for production of parboiled rice and discuss the factors affecting a rice mill capacity. 10

(c) Discuss in brief working of an LSU drier. 10

(d) Draw neat sketch of a cyclone separator and discuss its working principle. 10