

<b>CSM – 13/18</b>
<b>Agricultural Engineering</b>
<b>Paper – II</b>

*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.*

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**SECTION – A**

1. Answer any **three** of the following :  $20 \times 3 = 60$ 
  - (a) What do you mean by valve timing diagram of a four stroke IC engine ? Describe the occurrence of events in a four cylinder four stroke engine in a tabular form having standard firing order for proper balancing.

(b) What are the basic difference in fuel supply system of petrol engine and diesel engine ?

Support your answer with neat sketch diagrams.

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(c) A farmer purchased a 35 hp tractor at the cost of Rs. 3,40,000.00 with an annual interest of 12%. Considering the life of the tractor as 10 years and annual use as 1000 hours, calculate cost of use of tractor per hour if it is engaged for hiring purpose.

(d) What are the hectare per hour theoretical field capacity and percent time loss for 4 and 6 row corn planter set for 600mm rows ? The row length is 400m and forward speed of each is 6 km/h. Assume the only time losses are 5 second per row for turning at each end and 60 second for filling the seed and fertilizers cans every second round.

2. (a) Describe the working principle of centrifugal governor used in the tractors. Explain governor hunting. 20
- (b) A tractor is equipped with 4-cylinder 4-stroke engine and it develops 45 hp at 1200rpm. Calculate : 20
- (i) The torque developed in kg-m
- (ii) The volume of fuel required for a single power impulse in any cylinder if the SFC is 0.225 kg/bhp-hr and specific gravity is 0.80
- (c) Elaborate the function of differential with the help of suitable sketch. What are the advantages of the differential locks ? 20
3. (a) What are the various forces acting upon the mould board plough used for tillage operation ? Elaborate graphically. 20
- (b) A high speed diesel engine running at 2000 rev/min has single cylinder. During compression stroke, about  $20^\circ$  before the

top dead centre, the fuel injection starts and ends at the top dead centre. Calculate the duration in seconds, the fuel injection takes place in the cylinder. 20

(c) Maximum yield of maize is obtained with a population of 40000 plants per hectare. The rows are 100cm apart and an average emergence is 90% expected. What would be the seed spacing ? 20

4. (a) Discuss the various forms of energy used in agricultural production system. Elaborate each of them mentioning their pros and cons.

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(b) What are the various constituents present in the producer gas ? Explain the different types of gasifier with the help of suitable diagram. 20

(c) Elaborate the basic difference between solar flat plate collector and solar concentrator. Under what condition these two are recommended for various uses. 20

## SECTION – B

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

- (a) What are the principles applied for cleaning and grading of grains and seeds ?
- (b) Explain the various methods for feeding and discharge in a belt conveyor.
- (c) Describe the functioning of strain gauge type drawbar dynamometer.
- (d) Cane sugar solution is concentrated in an evaporator @ 10000kg/day. The feed solution contains 38% sugar by weight which is increased to 74% after concentration. Calculate the amount of product and water removed.

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6. (a) What are the different uses of idler pulley in a conveyor belt as well as in mechanical transmission ? 20
- (b) Describe the working principle of torque transducers. Show the position of the strain

gauges over the shaft and their circuit connectivity. 20

(c) Discuss the principle of working of (i) drum dryer and (ii) spray dryer. 20

7. (a) Mention the methods for measurement of various textural qualities of food by TPA (Textural Profile Analyser). 20

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

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(c) The power requirement for milling wheat from 4.33 mm to 0.35mm size was 8kW. Calculate the power requirement for milling the same to final size of 0.157mm using (i) Rittinger's law and (ii) Kicks's law. 20

8. (a) What do you understand by pasteurization ? Describe the working of HTST pasteurizer with the help of a neat diagram. How it differs with bath type pasteurizer ? 20

- (b) What is a Transducer ? Distinguish between active and passive transducers. 20
- (c) Explain the functioning of compression refrigeration system with the help of suitable sketch. What are cares to be taken for proper maintenance ? 20

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