02
Optional Paper
Agricultural Engineering
Paper – II

Time : 3 Hours	Maximum Marks : 200

IMPORTANT NOTES / महत्वपूर्ण निर्देश

(A) Please fill up the OMR Sheet of this Question Answer Booklet properly before answering. Please also see the directions printed on the obverse before filling it.

प्रश्नोत्तर पुस्तिका में प्रश्न हल करने से पूर्व उसके संलग्न ओ.एम.आर. पत्रक को भली प्रकार भर लें । उसे भरने हेतु उसके पृष्ठ भाग पर मुद्रित निर्देशों का अध्ययन कर लें ।

(B) The question paper has been divided into three Parts - **A**, **B** and **C**. The number of questions to be attempted and their marks are indicated in each part.

प्रश्न-पत्र अ, व और स तीन भागों में विभाजित है । प्रत्येक भाग में से किये जाने वाले प्रश्नों की संख्या और उनके अंक उस भाग में अंकित किये गये हैं ।

(C) Attempt answers in **English**.

उत्तर अंग्रेजी भाषा में दीजिये ।

(D) Answers to all the questions of each part should be written continuously in the script and should not be mixed with those of other parts. In the event of candidate writing answers to a question in a part different to the one to which the question belongs, the question will not be assessed by the examiner.

उत्तर पुस्तिका में प्रत्येक भाग के समस्त प्रश्नों के उत्तर क्रमवार देने चाहिये तथा एक भाग में दूसरे भाग के उत्तर नहीं मिलाने चाहिये । एक भाग में दूसरे भाग के प्रश्न के उत्तर लिखे जाने पर ऐसे प्रश्न को जाँचा नहीं जा सकता है ।

(E) The candidates should not write the answers beyond the limit of words prescribed in parts A, B and C failing this the marks can be deducted.

अभ्यर्थियों को भाग अ, व और स में अपने उत्तर निर्धारित शब्दों की सीमा से अधिक नहीं लिखने चाहिये। इसका उल्लंघन करने पर अंक काटे जा सकते हैं ।

(F) <u>In case the candidate makes any identification mark i.e. Roll No./Name/Telephone No./Mobile No. or any other marking either outside or inside the answer book, it would be treated as resorting to using unfair means. In such a case his candidature shall be rejected for the entire examination by the Commission.</u>

अभ्यर्थी द्वारा उत्तर पुस्तिका के अंदर अथवा बाहर पहचान चिन्ह यथा – रोल नम्बर / नाम / मोबाईल नम्बर / टेलीफोन नम्बर लिखे जाने या अन्य कोई निशान इत्यादि अंकित किये जाने को अनुचित साधन मान जावेगा। आयोग द्वारा ऐसा पाये जाने पर अभ्यर्थी की सम्पूर्ण परीक्षा में अभ्यर्थिता रद्द कर दी जायेगी ।

2

PART – A

Note : Attempt all the **twenty** questions. Each question carries **2** marks. Answer should not exceed **15** words.

1   Name the type of mechanism used in a piston-crankshaft arrangement in an IC engine.

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2   Differentiate between pull and draft.

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3   Define Cetane Number.

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4   Why direct injection is preferred in tractor engines?

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5   How does depth of cut of a trailed offset disc harrow adjusted?

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6   Write an equation to determine brake horsepower of an engine and name the different notations.

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7   What is the function of a radiator pressure cap?

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8   Why rear wheels of general purpose tractors are larger than front wheels?

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9   Why tractors are provided with independent rear wheel brake pedals?

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10   What are the different ways of hitching an implement with a tractor?

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11   What is the standard speed of a single phase electric motor?

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12   What is the unit in which kinematic viscosity of high speed diesel is expressed?

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13   How does the milling recovery in rice milling process expressed?

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14   Write an equation to determine power requirement of a upside loaded bucket elevator?

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15   Define modulus of elasticity.

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16   Define the term yield point.

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17   Define the term solar azimuth.

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18   Define the term U-value.

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19 What is content of methane and carbon dioxide in biogas produced by anaerobic digestion of cattle manure?

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20 What are the two major designs of family size biogas plants popular in India?

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Note :   Attempt all the **twelve** questions. Each question carries **5** marks. Answer should not exceed **50** words.

21   Why certain valve clearance is necessary in an engine?

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22   Why an oil bath type air cleaner is preferred in Indian tractors?

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23 Why tractors are provided with a PTO shaft?

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24 Why a differential unit is used in a tractor?

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25 Which kind of seed metering mechanism is used in a wheat seed drill and how the seed rate is regulated?

26 List the different types of metering mechanisms used for granular fertilizers?

27 List different types of positive displacement pumps used in plant protection equipment.

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28 A cantilever beam is 2m long. The cross-section of the beam is hollow square, with external sides as 60 mm and internal side is such that $I = 6 \times 10^5$ mm^4. If the safe bending stress for the material is 100 N/mm^2, calculate safe concentrated load at the free end.

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29 Calculate the electricity bill for a month, if a feed grinder works for 5h/day for 30 days. The hourly consumption is 45 kWh. Assume electricity charges at the rate of Rs. 3/unit.

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30 What are the different biomass conversion routes to produce energy efficient biofuels?

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31 List the major factors which affect efficiency of a grain drier.

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32 A sample of wheat grains was dried in a thin layer at 65°C. The moisture content present on dry basis at 0, 1, and 2 hours intervals were 25.3, 18.5 and 15.5 respectively. Determine the equivalent moisture content.

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Note :   Attempt any 5 questions. Each question carries 20 marks. Answer should not exceed 200 words.

33   Explain working of a full pressure lubrication system of a tractor engine with the help of a neat diagram.

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34 Draw a neat figure showing different zones of a up-drought gasifier indicating temperature and reactions occurring at these zones.

35 A pair of bullocks weigh 600 kg and pull about $\frac{1}{10}^{th}$ of their body weight. Find out the power required and the power available to pull a 5 × 20 cm seeder when each of the five furrow openers makes a rectangle furrow cross-section of 5cm wide × 5 cm deep. The soil resistance to the seeder is 0.4 kg/cm² and seeder is operating at a speed of 2 km/h.

36 Draw a neat figure showing different components of a Deenbandhu biogas plant and discuss its working.

37 Determine the shape factor for the beam shown in the figure below.

38 Draw a neat figure showing details of an LSU drier and describe its working.
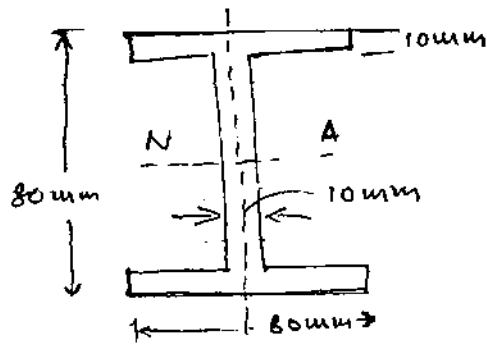
39 A tractor costing Rs. 3.0 lacs is expected to have an useful life of 10 years. The salvage value is 10%. Calculate the depreciated value after 6 years using different methods of depreciation.