7457

BOARD DIPLOMA EXAMINATION, (C-20) JUNE/JULY—2022

DME - FOURTH SEMESTER EXAMINATION

HEAT POWER ENGINEERING-I

Time: 3 hours] [Total Marks: 80

PART—A

3×10=30

- **Instructions:** (1) Answer **all** questions.
 - (2) Each question carries three marks.
 - (3) Answer should be brief and straight to the point and shall not exceed five simple sentences.
 - 1. What are the chemicals used in ORSAT apparatus to absorb various combustion products lime CO₂ and CO.
 - 2. What is meant by the terms reactants and products with respect to combustion of fuels and give on example to each.
 - 3. Define: (a) IC engine, (b) EC engine and also give one example to each.
 - 4. List out any three advantages and three disadvantages of SI engine over CI engine.
 - 5. Define the following terms with respect to performance of IC engines. (a) Air fuel ration Specific fuel consumption (b)

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6. Draw the following model performance curves of SI engine.

(a) RPM Vs IP

(b) RPM Vs BP

(c) RPM Vs FP

- **7**. Draw a line diagram of vane blower which does depict its functionality.
- 8. Identify any six uses of compressed air.
- 9. List out any three applications in each case (a) gas turbines and (b) jet engines.
- **10**. Compare turbo prop engine with turbo jet engine.

PART—B

 $8 \times 5 = 40$

- **Instructions:** (1) Answer **all** questions.
 - (2) Each question carries **eight** marks.
 - (3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.
 - 11. A flue gas consists of 12% CO_2 , 4.2% CO, 1.4% O_2 and rest is N_2 by volume. Convert this volumetric analysis to mass analysis.

(OR)

A flue gas consists of 25% CH_4 , 40% CO, 15% H_2 and rest is N_2 by mass. Convert this mass analysis to volumetric analysis.

12. Describe the working principle of four-stroke Diesel engine with a line diagram for each stroke.

(OR)

What is the necessity of providing cooling system for an IC engine. Describe any three methods of cooling.

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The following observations were recorded when the engine was tested at full load:

Weight suspended = 0.38 kN

Spring balance reading = 0.05kN

Speed of the engine = 400 RPM

Diameter of break drum = 1150 mm

Diameter of rope = 100 mm

Area of the indicator card = 300 mm^2

Length of diagram = 40 mm.

Spring constant = $0.1 \text{ N/mm}^2 \text{ per mm}$

Fuel consumption = 2.8 kg/hr

Calorific value of fuel = 42000 kJ/kg

Calculate

- a) IP
- b) BP
- c) Mechanical efficiency
- d) Brake thermal efficiency

List out any three objectives of testing of an IC engine.

A single-cylinder, four-stroke oil engine 165 mm bore and 190 mm stroke works on diesel cycle. The details of indicator card are as follows:

Area of indicator card = 300 mm^2

Length of the diagram = 400 dmm

Spring constant = $0.1 \text{ N/mm}^2 \text{ per mm}$

Speed of the engine = 400 RPM

Calculate IP and BP if mechanical efficiency is 70%.

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14. 8 kg of air at a pressure of 2 bar and temperature 40 °C is compressed to a pressure 3.5 bar according to the law $PV^{1.25}$ = constant. The air is now cooled at this pressure to 50 °C and them compressed to 10 bar according to same law. Calculate: a) work done and b) total heat rejection in the inter cooler. Assume characteristics gas constant is 0.287 kJ/kg K and specific heat at constant pressure is 1.005 kJ/kg K.

(OR)

Compare Reciprocating compressor with Rotary compressor in any five factors.

15. Describe constant volume gas turbine with a legible sketch and draw the P-V diagram of the cycle used in it.

(OR)

Describe Rocket engine with a legible sketch and mention any four applications of it.

PART—C

 $10 \times 1 = 10$

- **Instructions:** (1) Answer the following question.
 - (2) The question carries **ten** marks.
 - (3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.
 - **16.** Describe with a legible sketch the ignition system used in scooters.

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