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BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY-2022

DME – FOURTH SEMESTER EXAMINATION

HEAT POWER ENGINEERING-I

Time: 3 hours]

PART—A

[Total Marks: 80

 $3 \times 10 = 30$

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 CO_2 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 (b) Specific fuel consumption

/7457

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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.

8×5=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% CO₂, 4.2% CO, 1.4% O₂ and rest is N₂ 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. 13. A single-cylinder, four-stroke oil engine 160 mm bore and 200 mm stroke works on diesel cycle.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 mm² Length of diagram = 40 mm. Spring constant = 0.1 N/mm² per mm Fuel consumption = 2.8 kg/hr Calorific value of fuel = 42000 kJ/kg

Calculate

c) Mechanical efficiency

d) Brake thermal efficiency

b) BP

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 N/mm^2 per mm

a) IP

Speed of the engine = 400 RPM

Calculate IP and BP if mechanical efficiency is 70%.

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

10×1=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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