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C20-M–404

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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 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

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

8×5=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.

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 mm^2

Length of diagram = 40 mm.

Spring constant = 0·1 N/mm^2 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 N/mm^2 per mm

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.