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BIME-010

B. TECH.-VIEP-MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

June, 2019

BIME-010 : THERMAL ENGINEERING-II

Time : 3 Hours *Maximum Marks : 70*

***Note** : Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. State how are the air compressors classified ? Enumerate the applications of compressed air. 10

2. Following data related to a performance test of a single-acting 14 cm × 10 cm reciprocating compressor : 10

   Suction pressure = 1 bar

   Suction temperature = 20°C

   Discharge pressure = 6 bar

   Discharge temperature = 180°C

   Speed of compressor = 1200 rpm

   Shaft power = 6.25 kW

   Mass of air delivered = 1.7 kg/min.

Calculate the following :

(i) The indicated power

(ii) The isothermal efficiency

(iii) The mechanical efficiency

(iv) The overall isothermal efficiency

3. Why are two-stroke diesel engine, for large power, more common than two-stroke SI engines ? 10

4. How does the valve timing of a two stroke engine differ from that of four stroke cycle engine ? 10

5. Explain why a SI engine fails to operate if the air-fuel ratio is more than 20 : 1 while a C. I. engine can operate on an air-fuel ratio of even 50 : 1. 10

6. A four-cylinder, four-stroke petrol engine of cylinder bore and stroke each equal to 77 mm has a compression ratio of 8.5 : 1. The relative efficiency is 50% when specific fuel consumption is 0.28 kg/kWh. 10

Determine :

(a) The C.V. of the petrol in MJ/kg.

(b) The petrol consumption in kg/h.

Given that the i. m. e. p. is 950 kPa when the engine speed is 3000 rpm.

Take γ for air = 1.4.

7. The following results refer to a test on a petrol engine : 10

Indicate power = 30 kW

Brake power = 26 kW

Engine speed = 1000 rpm

Fuel per brake-power hour = 0.35 kg.

Calorific value of the fuel used = 43900 kJ/kg

Calculate :

(a) The indicated thermal efficiency

(b) The brake thermal efficiency

(c) The mechanical efficiency

8. (a) State the relative advantages and disadvantages of battery and magnetic-ignition systems. 5

(b) What do you mean by pre-ignition ? How can it be detected ? 5

9. (a) What is meant by ignition delay ? 5

(b) What are the causes of knock in C. I. engines ? 5

10. During the trial of a four-stroke cycle gas engine the following data were recorded : 5 + 5

Area of indicator diagram = 565.8 mm^2

Length of indicator diagram = 74.8 mm

Spring index = 0.9 bar/mm

Cylinder diameter = 220 mm

Stroke length = 430 mm

Number of explosions/min = 100

Determine :

(a) Indicated mean effective pressure

(b) Indicated power