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Question Paper Code : 41396

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Fourth/Sixth Semester

ME 6404 – THERMAL ENGINEERING

(Regulations 2013)

Time : Three Hours   Maximum : 100 Marks

(Use of Steam Table, Mollier chart, Refrigeration table and Psychrometric charts are permitted.)

Answer ALL questions.

PART – A   (10×2=20 Marks)

1. Draw the PV diagram of Diesel and Otto Cycle.

2. Write down the air standard efficiency equation of Diesel cycle.

3. State the functions of flywheel, connecting rod, piston and crankshaft.

4. Draw an actual valve timing diagram of a four stroke diesel engine.

5. What is the effect friction in steam nozzle ?

6. Distinguish between impulse and reaction turbine.

7. Define isothermal and isentropic efficiency of reciprocating compressors.

8. What are the advantages of multistage compression ?

9. Compare vapour compression and absorption systems.

10. Define the term Air-conditioning.

PART – B   (5×13=65 Marks)

11. a) In an Otto cycle air at 17°C and 1 bar is compressed adiabatically until the pressure is 15 bar.. Heat is added at constant volume until the pressure rises to 40 bar. Calculate the air-standard efficiency, the compression ratio and the mean effective pressure for the cycle. Assume $C_v = 0.717$ kJ/kg K and $R = 8.314$ kJ/kmol K.   (13)

(OR)

b) The mean effective pressure of an ideal Diesel cycle is 8 bar.. If the initial pressure is 1.03 bar and the compression ratio is 12, determine the cutoff ratio and the air standard efficiency. Assume ratio of specific heat for air to be 1.4.   **(13)**

12. a) Explain the construction and working Battery and Magneto Ignition System with neat sketch.   **(13)**

(OR)

b) Explain the working of multi-point fuel injection system with block diagram.   **(13)**

13. a) Elucidate the working of velocity, pressure and velocity pressure compounding methods with neat sketch.   **(13)**

(OR)

b) Derive the condition for maximum flow rate in steam nozzle.   **(13)**

14. a) A single-stage single-acting compressor delivers $15m^3$ of free air per minute from 1 a bar to 8 bar. The speed of compressor is 300 rpm. Assuming that compression and expansion follow the law $pv^{1.3} = c$ and clearance is 1/16th of swept volume, find IP, diameter and stroke of the compressor. Take L/D = 1.5. The temperature and pressure of air at the suction are same as atmospheric air.   **(13)**

(OR)

b) Discuss the application, working and terminology of reciprocating compressors.   **(13)**

15. a) Explain the working of vapour absorption refrigeration cycle with a neat schematic layout.   **(13)**

(OR)

b) A F_{12} vapour compression refrigeration system has a condensing temperature of 50°C and evaporating temperature of 0°C. The refrigeration capacity is 7 tons. The liquid leaving the condenser is saturated liquid and compression is isentropic. Determine i) The refrigerant flow rate ii) The power required to run the compressor iii) The heat rejected in the plant and iv) COP of the system Use the properties of F_{12} as listed in the table.   **(13)**

Temp (°C)	Pressure (bar)	h_f (kJ/kg)	h_g (kJ.kg)	S_f (kJ.kg K)	S_g (kJ.kg K)
50	12.199	84.868	206.298	0.3034	0.6792
0	3.086	36.022	187.397	0.1418	0.6960

PART – C   (1×15=15 Marks)

16. a) Explain design and working of summer air conditioning for Hot and Dry and Hot and Wet Weather.   (15)

(OR)

b) A six cylinder 4 stroke SI engine having a piston displacement of 700 cc per cylinder develops 78kw at 3200 rpm and consumed 27 kg/h of petrol. The calorific value of petrol is 44 MJ/ks. Determine

   i) Volumetric efficiency it A/F ratio is 12 and intake air is at 0.9 bar and 32°C. K_{air} = 287 J/kg.k

   ii) Brake thermal efficiency

   iii) Brake torque.

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ii) Brake thermal efficiency

iii) Brake torque.