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Question Paper Code : 31567

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fifth Semester

Mechanical Engineering

ME 2301/ME 51/ME 1351 A/10122 ME 402 — THERMAL ENGINEERING

(Regulation 2008/2010)

(Common to PTME 2301 – Thermal Engineering for B.E. (Part-Time) Mechanical Engineering Fourth Semester – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. For a given compression ratio the Otto cycle is more efficient than Diesel cycle. Justify?

2. What is meant by mean effective pressure?

3. What is a unit injection system?

4. What do you mean by short circuiting in two-stroke engines?

5. Define coefficient of friction in nozzle.

6. Define the term – critical pressure ratio.

7. List the effects of inter-cooling in a multi stage compression process.

8. Give the classification of compressor based on movement of piston.

9. List out the components in the vapour absorption refrigeration system.

10. List two desirable properties of refrigerants.

PART B — (5 × 16 = 80 marks)

11. (a) An air standard Diesel cycle has a compression ratio of 18. The pressure at the beginning of compression stroke is 1 bar and the temperature is 30°C. The heat supplied is 1800 kJ/kg. Determine :

(i) The Efficiency (4)

(ii) Pressure and temperature at salient points (4)

(iii) Heat Rejected (4)

(iv) Mean Effective Pressure. Assume the C_p, C_v, R, γ suitably. (4)

Or

(b) An Otto cycle has a compression ratio of 7. The initial pressure and temperature at the beginning of compression stroke is 1 bar and 40°C. The heat supplied is 2510 kJ/kg. Find

(i) The maximum temperature and pressure (4)

(ii) Workdone per of air (4)

(iii) The cycle efficiency (4)

(iv) Mean effective pressure. Take is $C_V = 0.713\,kJ/kg$ K and R = 287 J / kg K. (4)

12. (a) Discuss the construction and working principle of a four stroke engine with sketch. (16)

Or

(b) Explain the construction and working principle of Battery coil ignition system with neat sketch. (16)

13. (a) Steam expands isoentropically in a nozzle from 1 MPa, 250°C to 10 kPa. The flow rate of the steam is 1 kg/s. Find the following when the inlet velocity is neglected

(i) Quality of Steam (6)

(ii) Velocity of Steam at exit of the nozzle (5)

(iii) Exit area of the nozzle. (5)

Or

(b) Explain the pressure and velocity compounding diagram of an multi-stage turbines with sketch. (16)

14. (a) In a two stage compressor in which inter-cooling is perfect, prove that work done in the compressor is minimum when the pressure in the inter-cooler is geometric mean between the initial and final pressure. Draw the P-V&T-S diagram for Two Stage Compression. (16)

Or

(b) Explain the construction and working principles of Multi stage compressor and discuss the perfect and im-perfect intercooling with neat sketch. (16)

15. (a) The temperature limits of Ammonia Refrigeration System are 25°C and -10°C. If the gas is dry at the end of Compression, Calculate the COP of the cycle assuming no under-cooling of the liquid ammonia. The properties of Ammonia are given below. (16)

Temperature in ° C	Liquid Heat	Latent Heat	Liquid Entropy
25	298.90	1166.94	1.2420
-10	135.37	1297.68	0.5443

Or

(b) Explain the construction and working of Vapour compression refrigeration system with neat sketch. (16)