Reg. No. :

Question Paper Code : 91650

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

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. Draw the actual PV diagram of two stroke engine.

2. What is meant by mean effective pressure?

3. What is meant by valve overlapping period?

4. What do you understand by ignition delay?

5. Define coefficient of velocity in nozzle.

6. Define degree of reaction.

7. What is the effect of inter cooling in multi stage compressor?

8. Define isentropic efficiency of reciprocating compressor.

9. List out any two desirable properties of refrigerants.

10. What is room sensible heat factor?

PART B — (5 × 16 = 80 marks)

11. (a) An engine works on Otto cycle. The initial pressure and temperature of the air is 1 bar and 40° C. 825 kJ of heat is supplied per kg of air at the end of the compression. Find the temperature and pressure at all salient points if the compression ratio is 6. Also find the efficiency and mean effective pressure for the cycle. Assume air is used as working fluid and take all ideal conditions.

Or

(b) A gas turbine works on an air standard Brayton cycle. The initial condition of the air is 25° C and 1 bar. The maximum pressure and temperature are limited to 3 bar and 650° C. Determine the following :

   (i) Cycle efficiency

   (ii) Heat supplied and rejected per kg of air

   (iii) Work output

   (iv) Exhaust temperature.

12. (a) Explain the working principle of diesel injector with a neat sketch.

Or

(b) Calculate the diameter and length of the stroke of a diesel engine working on four stroke constant pressure cycle from the following data. Indicated power = 18.75 kW, rotation per minute = 220, Compression ratio = 14, Fuel cut off = 1/20th of the stroke, Index of expansion = 1.3, Index of compression = 1.35, Length/diameter = 1.5. Assume the pressure and temperature of the air at the inlet are 1 bar and 40° C respectively.

13. (a) Steam at a pressure of 10.5 bar and 0.95 dry is expanded through a convergent divergent nozzle. The pressure of steam leaving the nozzle is 0.85 bar. Find the velocity of steam at throat for maximum discharge. Take $n = 1.135$. Also find the area at the exit and the steam discharge if the throat area is 1.2 cm². Assume the flow is isentropic and there are no friction losses.

Or

(b) Explain the pressure and velocity compounding diagram of multi stage turbine with neat a sketch.

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14. (a) Derive the expression for volumetric efficiency of reciprocating air compressor.

Or

(b) Explain the construction and working of Multi stage compressor and discuss the perfect and imperfect inter cooling with neat a sketch.

15. (a) Explain the construction and working of vapour absorption refrigeration system.

Or

(b) Explain the desirable thermodynamic properties and environmental safety aspects of alternative refrigerants.

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