Question Paper Code : 42848

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

Fifth Semester

Mechanical Engineering

ME2301 – THERMAL ENGINEERING

(Common to Mechanical Engineering (Sandwich))

(Regulations 2008)

(Also common to PTME 2301 – Thermal Engineering for B.E. (Part-Time) Fourth

Semester – Mechanical Engineering – Regulations 2009)

Time : Three Hours   Maximum : 100 Marks

State clearly any assumption made with justification

Use of approved steam table/psychrometric chart/Refrigerant property table are permitted

Answer ALL questions

PART – A   **(10×2=20 Marks)**

1. Mention the processes involved in Diesel cycle.

2. What is mean effective pressure of an engine ?

3. What constitutes an engine ?

4. What is a two stroke engine ?

5. How impulse turbine is classified ?

6. Define 'coefficient of nozzle'.

7. List advantages of multistage compression.

8. What is Free Air Delivery (FAD) ?

9. What is the main difference between the vapour absorption and vapour compression systems ?

10. What is Psychrometric chart ?

PART – B (5×16=80 Marks)

11. a) What is Otto cycle ? Draw a P-v and T-s diagram of Otto cycle and explain the processes involved in Otto cycle. Also obtain the expression for efficiency of Otto cycle.

(OR)

b) In a compression ignition engine, working on a dual combustion cycle, pressure and temperature at the start of compression are 1 bar and 300 K respectively. At the end of compression, pressure reaches a value of 25 bar. The heat is supplied at 420 kJ per kg of air during constant volume heating and pressure becomes 2.8 bar at the end of isentropic expansion. Estimate the ideal cycle efficiency. Take C_p = 1005 J/(kg.K) and C_v = 712 J/(kg.K).

12. a) What is the use of carburetor in IC engine ? Draw a schematic of Carburetor and discuss the function of Carburetor.

(OR)

b) i) Give the detailed difference between Four-stroke and Two-stroke cycle engines. (10)

ii) Why fuel injection system is vital part of CI engines ? Discuss. (6)

13. a) Dry saturated steam at the pressure of 15 bar enters in a nozzle and discharged with a pressure of 1.5 bar. If the dryness fraction of discharge steam is 0.9, find the final velocity of the steam, when the initial velocity of the steam is negligible. If 10% of the heat drop is lost in friction, find the percentage reduction in the final velocity.

(OR)

b) With a neat diagram explain the working of impulse and reaction turbine.

14. a) A 3-stage compressor delivers air at 70 bar from an atmospheric pressure of 1 bar and 30°C. Assuming the intercooling complete, estimate the amount of minimum work required to deal with 1 kg of air. Also find the amount of heat rejected in each intercooler. The index of compression is 1.2 throughout. Take air C_p = 1005 J/(kg.K).

(OR)

b) i) Identify the possible differences between reciprocating and rotary air compressor. (10)

ii) State the mechanical, isentropic and volumetric efficiency of compressor. (6)

15. a) i) What is Room sensible heat factor, grand sensible heat factor, effective room sensible heat factor and by pass factor ? (8)

ii) What is refrigerant ? List out the desirable properties of refrigerant. (8)

(OR)

b) A vapour compression refrigerator uses methyl chloride (R-40) and operates between temperature limits of –10°C and 45°C. At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of 60°C. Find the C.O.P. of the refrigerator. The relevant properties of methyl chloride are as follows :

Saturation Temperature in °C	Enthalpy in kJ/kg		Entropy in kJ/kg K	
	Liquid	Vapour	Liquid	Vapour
–10	45.4	460.7	0.183	1.637
45	133.0	483.6	0.485	1.587

15. a) i) What is COP ? What is sensible heat factor, grand sensible heat factor, effective room sensible heat factor and by pass factor ?

   ii) What is refrigerant ? List out the desirable properties of refrigerant.

(OR)

b) A vapour compression refrigerator uses methyl chloride (R-40) and operates between temperature limits of -10°C and 45°C. At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of 60°C. Find the C.O.P. of the refrigerator. The relevant properties of methyl chloride are as follows :-

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