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**L 1482**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Fourth Semester

Mechanical Engineering

ME 237 — THERMAL ENGINEERING

Time : Three hours

Maximum : 100 marks

(Use of Steam table/charts and refrigeration table/charts is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the primary requirements of a boiler.
2. What is the function of feed check valve?
3. Define degree of reaction.
4. Differentiate impulse turbine from reaction turbine.
5. Draw the p-v and T-s diagram for dual cycle.
6. What is the purpose of having fins in the engine cooling system?
7. What is detonation?
8. Define cetane and octane number of fuels.
9. What are the advantages of central air conditioning?
10. What are the desirable characteristics of a refrigerant?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the types of water tube boilers and explain the principle of any one type with a neat sketch. (12)

(ii) Differentiate fire tube boiler from water tube boiler. (4)

Or

(b) Explain the following with sketch : (16)

(i) Steam stop valve

(ii) Fusible plug

(iii) Steam trap

(iv) Economiser.

12. (a) A single stage impulse turbine rotor has a diameter of 1.2m running at 3000rpm. The nozzle angle is  $18^\circ$ . Blade speed ratio is 0.42. The ratio of the relative velocity at outlet to relative velocity at inlet is 0.9. The outlet angle of the blade is  $3^\circ$  smaller than the inlet angle. The steam flow rate is 5kg/sec. Draw the velocity diagram and find the following :

(i) Velocity of whirl,

(ii) axial thrust on the bearing,

(iii) blade angles,

(iv) Power developed. (16)

Or

(b) Explain the different methods of governing in steam turbines. (16)

13. (a) (i) Draw the port timing diagram for a two stroke engine and explain it. (8)

(ii) Differentiate compression ignition engine from spark ignition engine. (8)

Or

(b) (i) Describe the ignition system of an IC engine with a neat diagram.(8)

(ii) Discuss any one type of lubrication system of a CI engine. (8)

14. (a) (i) Explain two stroke crankcase scavenging. (8)  
(ii) Explain the different combustion stages of a CI engine. (8)

Or

(b) Air consumption for a four stroke petrol engine is measured by means of a circular orifice of diameter 3.5 cm. The coefficient of discharge for the orifice is 0.6 and the pressure across the orifice is 14 cm of water. The barometer reads 76 cm of Hg. Temperature of air in the room is 24° C. The piston displacement volume is 1800 cm<sup>3</sup>. The compression ratio is 6.5. The fuel consumption is 0.13 kg/min and calorific value is 44,000 kJ/kg. The brake power developed at 2500 rpm is 28 kW. Determine

- (i) Air-fuel ratio,  
(ii) volumetric efficiency on the basis of air alone,  
(iii) brake mean effective pressure,  
(iv) relative efficiency on the brake thermal efficiency basis. (16)
15. (a) (i) Discuss the different internal heat sources in an air conditioned hall. (8)  
(ii) Describe the variables involved in estimation of load for air conditioners. (8)

Or

- (b) (i) Explain the working principle of year round air conditioning system with a sketch. (10)  
(ii) Explain any two components of an air conditioning unit. (6)