Reg. No. :

P 1330

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

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. What are the factors to be considered for selection of steam boilers?

2. What is the function of superheater?

3. Define two stage impulse turbine.

4. What is meant by height of blades as applied to a reaction turbine?

5. What is meant by injection lag?

6. What are the requirements of a good carburetor?

7. Define scavenging ratio.

8. Define brake mean effective pressure.

9. Define specific humidity.

10. What is meant by adiabatic saturation?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the construction and working of a Lancashire boiler with the help of neat sketch.   (10)

        (ii) Compare water tube boiler with fire tube boiler.   (6)

Or

(b) (i) Differentiate between lever safety valve and dead weight safety valve. (8)

(ii) Explain the working of an economiser in a boiler plant with a neat sketch. (8)

12. (a) The steam enters an impulse wheel having a nozzle angle of 20° at a velocity of 450 m/sec. The exit angle of the moving blade is 20° and the relative velocity of the steam may be assumed to remain constant over the moving blades. If the blade speed is 180 m/sec, determine (i) Blade angle at inlet (ii) Work done per kg of steam (iii) Power of the wheel, when the turbine is supplied with 1.8 kg of steam per second. (16)

Or

(b) The blade angles of both fixed and moving blades of reaction steam turbine are 35° at the receiving tips and 20° at the discharging tips. At a certain point in the turbine, the drum diameter is 1.37 m and blade height is 127 mm. The pressure of steam supply to a ring of fixed blades at this point is 1.25 bar and the dryness fraction is 0.925. Find the work done in next row of moving blades for 1 kg of steam at 600 rpm, the steam passing through the blades without shock. Assuming an efficiency of 85% for the pair of rings of fixed and moving blades, find the heat drop in the pair and state the properties of steam at the entrance to the next row of fixed blades. (16)

13. (a) (i) Explain the magneto ignition system with a neat sketch. (8)

(ii) Explain the significance of flame speed and its influence on combustion in S.I.engine. (8)

Or

(b) (i) Compare the petrol and diesel engines with reference to the following :

(1) Power to weight ratio

(2) Acceleration response

(3) Economy in road transport

(4) Maintenance and repair. (12)

(ii) Enumerate the desirable properties of a good fuel for a petrol engine. (4)

14. (a) Explain briefly

    (i) Indicator card method

    (ii) Extrapolation method

    (iii) Retardation method

    (iv) Morse test. (16)

Or

(b) A four stroke petrol engine has a piston displacement of 2210 cm³. The compression ration is 6.4. The fuel consumption is 0.13 kg/min. The calorific value of fuel is 45000 KJ/kg. The brake power developed while running at 2500 rev/min is 50.25 KW. Determine the brake mean effective pressure and the relative efficiency based on brake thermal efficiency. (16)

15. (a) A cinema hall of seating capacity 1500 persons has been provided with an air conditioned plant with the following data :

Outdoor conditions = 40°C DBT and 20°C WBT

Required conditions = 20°C DBT and 60% RH

Amount of air supplied = 0.3 m³/min/person.

If the required condition is achieved first by adiabatic humidifying and then cooling, find the capacity of the cooling coil and capacity of the humidifier. (16)

Or

(b) (i) Explain the winter air conditioning system with the help of a neat sketch. (10)

    (ii) Explain the following terms :

        (1) Degree of saturation

        (2) Dew point temperature

        (3) Humidity ratio. (6)