B 2333

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Fourth Semester

Mechanical Engineering

ME 237 — THERMAL ENGINEERING

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between Fire tube and water tube Boiler with an example for each.

2. What is Fusible Plug?

3. Define 'degree of reaction' in a Steam Turbine.

4. Draw the pressure, velocity Diagram of a Velocity Compounded Impulse Turbine.

5. Define Cetane Number of a Fuel.

6. What is Ignition delay? What is its effect on knocking of SI engine?

7. What is the function of idling jet in a carburetor?

8. Differentiate between scavenging and supercharging.

9. What is Sensible Heat Factor?

10. What is Adiabatic Saturation Temperature?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the various criteria for selection of a boiler? (8)

(ii) Explain the construction and working of an Economizer? (8)

Or

(b) (i) Explain with a neat diagram, construction and working of a Locomotive boiler. (8)

(ii) Explain the function of blow off cock and Steam Stop Valve. (8)

12. (a) (i) The data pertaining to impulse turbine is as follows:

Steam velocity = 500 m/s; Blade speed = 200 m/s; Exit angle of moving blade = 25°; Nozzle angle = 25°. Neglecting the effect of friction when passing through the blade passages, calculate (1) inlet angle of moving blade, (2) exit velocity and direction, (3) work done/kg of steam, (4) axial thrust and power for a steam flow rate of 5 kg/s, and (5) diagram efficiency. (10)

(ii) What is reheat factor in turbine? (6)

Or

(b) (i) In a Parson turbine running at 1500 r.p.m. the available enthalpy drop for an expansion is 65 kJ/kg. If the mean diameter of the rotor is 100 cm, find the number of rows of moving blades required, assume stage efficiency as 80%, blade outlet angle as 20° C and speed ratio as 0.7. (12)

(ii) What are the different methods commonly used for governing steam turbines? (4)

13. (a) (i) Explain with neat sketch Air Cooling of Engines. (8)

(ii) Explain any one lubrication system adopted in multicylinder SI engines. (8)

Or

(b) Explain the principle of Magneto ignition system. Enumerate its advantages and disadvantages? (16)

14. (a) (i) What are the various factors influencing the flame speed in SI Engines? (8)

(ii) Explain the combustion phenomenon in SI Engines. (8)

Or

(b) (i) A 4 – cylinder, 4-stroke petrol engine 6 cm bore and 9 cm stroke was tested at constant speed. The fuel supply was fixed to 0.13 kg/min and plugs of 4 – cylinders were successively short — circuited without change of speed :

The power - measurements were as follows :

With all cylinder working = 16.25 kW.

With No.1 – cylinder cut-off = 11.55 kWh,

With No.2 – cylinder cut-off = 11.65 kW(B.P)

With No. 3 – cylinder cut-off = 11.70 kW (B.P),

With No.4 – cylinder cut-off = 11.50kW (B.P)

Find (1) the I.P of the engine, (2) the Mechanical efficiency (3) Indicated thermal efficiency if CV. of fuel used is 42 000 kJ/kg (4) Also find the relative efficiency on I.P basis assuming clearance volume 65 cu cm. (10)

(ii) Explain the Diesel knock in SI Engines. (6)

15. (a) (i) Explain summer Air Conditioning with a neat layout. (10)

(ii) Sketch various processes of summer Air Conditioning in a Psychometric chart (6)

Or

(b) (i) What are the various loads for Air Conditioning. (8)

(ii) An air-conditioning plant is to be designed for a small office for winter conditions (8)

Out - door conditions	:	10°C DBT and 8°C WBT
Required indoor - conditions	:	20°C DBT and 60 % R.H
Amount of air circulation	:	0.3 m^3/min/person
Seating capacity of the office	:	50

The required condition is achieved first by heating and then by adiabatic humidifying. Find the followings :

(1) Heating capacity of the coil in kW and the surface temperature required if the bypass factor of the coil is 0.32.

(2) The capacity of the humidifier.
