IX. a) Describe about different types of solid fuel burning systems comparing advantages and disadvantages. (10)

b) With neat sketches explain different types of condensers and cooling water system. (10)

OR

X. a) Draw layout of a diesel power plant. Compare diesel power plant with hydropower plant mentioning merits and demerits. (10)

b) (i) With a neat sketch describe a pressurised water reactor.
(ii) What is a Fast Breeder Reactor (FBR)? (10)

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BTS 020 (D)

B.Tech. Degree IV Semester Examination, July 2001

ME 403 THERMAL ENGINEERING - II

Time: 3 Hours *Max.marks: 100*

I a) A carnot steam cycle operated between a source at 300° C and sink at 15° C. Determine the thermal efficiency and ratio of turbine work to compressor work when i) all the processes are reversible and ii) when isentropic efficiency of turbine is 0.8 and that of compressor is 0.6. Take dry saturated steam at inlet to the steam turbine. (13)

b) Explain about Binary vapour cycle. (7)

OR

II a) What is the effect of back pressure in flow through steam nozzles? (7)

b) Super heated steam enters a nozzle at a pressure of 25 bar and temperature 300° C and expands adiabatically to an exit pressure of 2 bar. Calculate:

(i) Exit speed of steam neglecting initial speed of steam at inlet of nozzle.
(ii) Exit area of nozzle for a mass flow rate of steam 1.25 kg/s. (13)

III a) Explain different methods of governing of steam turbines giving advantages and disadvantages of each. (7)

b) The nozzles of a de - laval turbine deliver one kg. of steam per second at a speed of 800 m/s. to a set of blades moving at 200 m/s. The nozzles are inclined at an angle of 16° to the plane of the wheel. Allowing a blade velocity coefficient of 0.8 calculate (i) Blading efficiency (ii) HP developed by blades (iii) Energy lost in blades per second. Blade angles at outlet may be taken as 25°. (13)

(P.T.O)

OR

IV In a gas turbine unit comprising of LP and HP compressors, air is taken in at 1.01 bar 27° C. Compression in LP stage is upto 3.03 bar followed by intercooling to 30° C pressure of air after HP compressor is 8.7 bar. Loss in pressure during intercooling is 0.13 bar.
Air from HP compressor is transferred to the exchanger of effectiveness 0.6 where it is heated by gases from LP turbine. Temperature of gases entering combustion chamber is 750° C. Gases expand in HP turbine to 3.25 bar, then reheated to 700° C before expanding in LP turbine. Loss of pressure in reheater is 0.1 bar. If isentropic efficiency of compression is 0.8 and expansion is 0.85. Calculate-

(i) overall efficiency
(ii) work ratio

Cp air = 1.005 KJ/KgK, Cp gases = 1.15 KJ/KgK

γ air = 1.4, γ gases = 1.3. Neglect mass of fuel. (20)

V a) Name various refrigerants. How a refrigerant is selected. Write important characteristics of refrigerants. (7)

b) A vapour compression refrigeration cycle Freon-12 is used as the refrigerant. Condenser pressure and evaporator pressure are 1.0 MN/m² and 120 KN/m² respectively. The fluid enters the compressor as saturated vapour and expansion value as saturated liquid. Taking compressor efficiency as 82%. Calculate the COP and refrigerant effect in kw/kg. (10)

c) Discuss effect of superheated refrigerant on performance of vapour compression cycle. (3)

OR

VI a) Discuss the effect of subcooling of refrigerant on the performance of vapour compression refrigeration cycle. (7)

Contd.....3.

VI. b) In a refrigerator working on Bell Coleman cycle, the air is drawn into the cylinder of the compressor from cold chamber at a pressure of 1 kfg/cm² and temperature 10°C. After isentropic compression to 5kgf/cm², air is cooled at constant pressure to a temperature of 20°C. The polytropic expansion $PV^{1.25}$ = constant, then follows and air expanded to 1 kgf/cm² is passed to cold chamber. Determine :

(i) Work done per kg of air flow.
(ii) Refrigerating effect per Kg of air flow.
(iii) COP.
(iv) Refrigerating capacity of plant in tons for a mass flow rate of 80 Kg/hr. (13)

VII. a) Explain humidification and dehumidification processes in a psychrometric chart. (7)

b) Air at 100 KN/m² and 42°C DBT with 60% RH passes through a cooling tower and leaves it at 40°C and 95% RH. The warm water is cooled from 45°C to 35°C in the tower. Water flow rate is 10 Kg/s. Calculate the mass flow rate of cooling air and quality of water loss due to evaporation. (13)

OR

VIII. a) Describe heating and cooling processes of atmospheric air and show that in a psychrometric chart. (7)

b) Atmospheric air at a pressure of 100 KN/m² and 32.2°C has a specific humidity W = 0.0095 Kg/Kg of dry air. Calculate -

(i) RH
(ii) Specific enthalpy
(iii) Vapour pressure
(iv) Specific volume
(v) Specific entropy
(vi) Dew point temperature. (13)

Contd.....4.