Code: 9A03501

R09

III B. Tech I Semester (R09) Supplementary Examinations, May 2012

THERMAL ENGINEERING II

(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) What is reheating? What the advantages of reheat Rankine cycle?
(b) A simple Rankine cycle works between pressures of 28 bar and 0.06 bar, the initial condition of steam being dry saturated. Calculate the cycle efficiency, work ratio and specific steam consumption rate.

2 (a) What is a boiler? Explain the classification of boilers.
(b) What is the necessity for safety valves in a boiler?

3 Dry and saturated steam expands in a convergent-divergent nozzle from 12 bar to 1 bar. The throat diameter is 1 cm and the divergent portion of the nozzle is 8 cm long. Neglecting the effect of friction, find out the semi cone angle of the divergent section.

4 Explain the pressure-compounded impulse steam turbine showing pressure and velocity variations along the axis of the turbine.

5 (a) What are the important considerations for selection of blade material for a steam turbine?
(b) What do you mean by steam turbine governing?

6 With a neat sketch explain the working of a jet condenser.

7 A gas turbine plant consists of two turbines. One turbine drives the compressor and the other develops the power output. Both turbines have their own combustion chambers which are served by air directly from the compressor. Air enters the compressor at 1 bar and 15ºC and is compressed to 8 bar with an isentropic efficiency of 80%. Due to heat addition in the combustion chamber, the inlet temperature of gas to both the turbines reaches to 900ºC. The isentropic efficiency of the turbine is 85%. The mass-flow rate of air at the compressor is 20 kg/s. The calorific value of fuel is 42000 kJ/kg. Calculate the output of plant and thermal efficiency, if mechanical efficiency is 96% and the generator efficiency is 95%. Take C_p=1.005 kJ/kgK and γ = 1.4 for air and C_p=1.128 kJ/kgK and γ = 1.34 for gases. Neglect the mass of fuel.

8 What are the different types of rocket engines? What are its applications?

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