Total No. of Questions :8] *[Total No. of Printed Pages :2*

Roll No .....

MMTP - 204

M.E./M.Tech., II Semester

Examination, June 2016

Steam and Gas Turbine

Time : Three Hours

Maximum Marks : 70

Note : Attempt any five questions. All questions carry equal marks. Draw neat diagrams wherever required.

1. a) Describe the operating principles of steam turbines.
   b) State the functions of each component of the steam turbine.

2. a) Discuss the role of Inter-cooling, and Reheat on the performance of steam turbines.
   b) Explain various energy losses in steam turbines along with their remedies.

3. Determine the air and kerosene flow rates for a 100-MW regenerative gas turbine with 1800K turbine inlet temperature, compressor pressure ratio of 5, and 1 atm. and 300k ambient conditions. The compressor and turbine efficiencies are 81% and 88%, respectively, and the heat exchanger effectiveness is 75%. Use a heating value for kerosene of 45,840kJ/kg. What is the engine specific fuel consumption?

4. a) Briefly discuss various stages of pressure losses in gas turbines.
   b) Compare constant pressure and constant volume gas turbine cycles.

5. a) Discuss working principle of turbo-jet and turbo propulsion systems.
   b) Explain the recent trends in turbine sizes and specifications.

6. A simple-cycle stationary gas turbine has compressor and turbine efficiencies of 0.85 and 0.9, respectively, and a compressor pressure ratio of 20. Determine the work of the compressor and the turbine, the net work, the turbine exit temperature, and the thermal efficiency for 20°C ambient and 1200°C turbine inlet temperatures.

7. An aircraft flies at a speed of 250m/s at an altitude of 5000m. The engines operate at a compressor pressure ratio of 8, with a turbine inlet temperature of 1200K. The compressor and turbine efficiencies are 0.9 and 0.87, respectively, and there is a 4% pressure loss in the combustion chamber. The inlet total pressure recovery is 0.97, and the engine-mass flow rate is 100kg/s. Use an engine mechanical efficiency of 0.99 and a fuel heating value of 43,000kJ/kg. Assume that the engine has a convergent, isentropic, nozzle flow. Determine the nozzle exit area, the engine thrust, specific thrust, fuel flow rate, and thrust specific fuel consumption.

8. Write short notes on the following (Any Two)
   a) Constant volume cycles
   b) Heat accumulators
   c) Gas turbine efficiency

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