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Roll No .....

MMTP-204

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

Examination, December 2017

Steam and Gas Turbine

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt any five questions.

ii) All questions carry equal marks.

iii) Use of steam table is permitted.

1. a) What is the effect of maximum pressure, superheat and back pressure on the thermal efficiency of steam turbine?

   b) Discuss the difference between the impulse and reaction turbine.

2. a) The first stage wheel running at 1500 rpm of a 20000kW turbine is a single row wheel having a mean diameter 2.1 metre. The condition of steam in the first stage is as follows:

   Pressure = 17.5 bar, Superheat 110°C, Specific volume 0.1503m³/kg. The blades are 3.2cm long and the active nozzle cover 40% of total circumference at full load. Calculate

   i) Power absorbed by disc friction

   ii) Power absorbed by blade windage and disc friction

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   b) Explain how the regenerative cycle efficiency may approach the carnot cycle efficiency.

3. a) What are the advantages and disadvantages of reheating in steam power plants and explain why it becomes more necessary to adopt a reheat cycle with high steam pressure?

   b) A steam turbine is divided into two sections, HP and LP with a reactor interposed in between the two sections. The steam on its way to turbine at 30 bar absolute and 500°C passes through a re-heater where it gives up heat at constant pressure to the steam flowing from HP turbine to LP section. The steam then enters the HP turbine at 30 bar absolute and 380°C. The steam leaves the HP turbine at 7 bar and the LP turbine at 0.07 bar abs. Assuming no loss of pressure between the two sections of the turbine and an internal efficiency of 0.8 for both sections, determine the steam condition at entrance to the LP section and the thermal efficiency of the plant.

4. Following particular relate to a mixed pressure turbine:

   Output at turbine coupling = 800kW

   Pressure of HP steam, 70.5°C superheat = 12.7 bar

   Pressure of LP steam, dry and saturated = 1.27 bar

   Exhaust pressure = 0.04bar

   If the power absorbed by bearing friction, governor drives etc. amounts to 15kW and that the internal efficiency ratio is 65% for both HP and LP operation. Calculate the steam consumption in kg/kWh for both methods of operation. Also find the steam pressure in the LP steam belt during operation with HP steam.

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5. a) What are the advantages of closed cycle gas turbine over the open cycle?

   b) What are the advantages and disadvantages of jet propulsion system over other systems?

6. a) Explain in brief the difference between the pressure compounding and velocity compounding.

   b) What is feed heater? Explain the various types of feed heaters.

7. a) Discuss the importance of mixed pressure turbine.

   b) Explain the principle of jet propulsion.

8. Write short note on:

   a) Heat accumulator

   b) Practical reheating

   c) Propulsive power and propulsive efficiency

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