Code: 9A03501

R09

B.Tech III Year I Semester (R09) Supplementary Examinations June 2016
THERMAL ENGINEERING – II
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
(Use of steam tables is permitted in the examination hall)
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1   (a)   What is regeneration? Draw the schematic and T-s diagram for an ideal regenerative cycle.
    (b)   An ideal regenerative cycle operates with steam supplied at 30 bar, 400ºC and a condenser pressure of 0.1 bar. For this cycle find the cycle efficiency and steam rate. Also, calculate the dryness fraction of steam extracted, if at the point of extraction the pressure is 5 bar.

2   (a)   Explain the construction and working of a simple vertical boiler with a neat sketch.
    (b)   A boiler evaporates 8 kg of water per kg of coal into dry saturated steam at 10 bar pressure. The feed water temperature is 46ºC. Find the equivalent evaporation from and at 100ºC. Also calculate the factor of evaporation.

3   Define nozzle efficiency. Explain the effect of friction on the performance of the nozzle with the help of h-s diagram.

4   (a)   Define two-stage impulse turbine. How will you draw the combined velocity triangle for such a turbine?
    (b)   Steam issuing from a nozzle at 600 m/s enters the first set of blades of a two row wheel impulse turbine. The tips of both the set of moving blades are inclined at 30º to the plane of motion. Find the speed of the blades, so that the steam is finally discharged axially. Neglect friction. Also find the power developed by the turbine, if the mass of steam supplied to the turbine is 3 kg/s.

5   Explain the working of a single-stage reaction turbine. Sketch pressure and velocity variations along the axis of the turbine. Show the expansion on h-s chart.

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

7   Air enters the compressor of a gas turbine plant operating on air-standard cycle at 100 kPa and 300 K with a volumetric flow rate of 5 m³/s. The compressor pressure ratio is 10. The turbine inlet temperature is 1400 K. The turbine and compressor each has an isentropic efficiency of 80%.
          Calculate: (i) Thermal efficiency of the cycle.
                     (ii) Back work ratio.
                     (iii) The net power developed in kW.

8   Explain using a neat sketch, the principle of operation of ram jet engine.

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