Code No: 55020 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B. Tech III Year I Semester Examinations, December - 2014
APPLIED THERMODYNAMICS-II
(Common to ME, AME)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) Explain about the P-V and T-S diagram of Rankine cycle and its working details.
b) State the methods of increasing the thermal efficiency of a Rankine cycle.

2.a) Differentiate between the fire-tube and Water-tube Boiler.
b) A steam generator evaporates 18000 Kg/h of steam at 12.5 bar and a quality of 0.97 from feed water at 105^0C, when coal is fired at the rate of 2040 Kg/h. If the Higher calorific value of the coal is 27400 KJ/kg, find
i) The heat rate of boiler in KJ/h.
ii) The equivalent evaporation.
iii) The thermal efficiency.

3.a) What do you mean by a supersaturated flow ? Explain with the help of h-s diagram.
b) Dry saturated steam at a pressure of 11 bar enters a convergent –divergent nozzle and leaves at a pressure of 2 bar. If the flow is adiabatic and frictionless, determine:
i) The exit velocity of steam.
ii) Ratio of cross section at exit and that at throat.
Assume index of adiabatic expansion to be 1.135.

4.a) What do you mean by compounding of a steam turbines? Discuss various methods of compounding steam turbines.
b) Derive the expression for maximum blade efficiency in a single-stage impulse turbine.

5. The following data relate to a stage of reaction turbine:
Mean rotor diameter = 1.5 m, speed ratio = 0.72, blade outlet angle = 20^0, rotor speed = 3000 rpm
a) Determine the diagram efficiency.
b) Determine the percentage increase in diagram efficiency and rotor speed if the rotor is designed to run at the best theoretical speed, the exit angle being 20^0.

6.a) Explain the reasons for inefficiency in surface condensers.
b) Explain about the working of Regenerative type surface condenser with neat sketch.

7.a) Describe with neat diagram a closed cycle gas turbine.? State also its merits and demerits.

b) A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 610^0C. The isentropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively. Calculate the power output in KW of an electric generator geared to the turbine when the air enters the compressor at 15^0C at the rate of 16 Kg/sec.

8.a) Explain about the working of Rocket engine with neat sketch.

b) Describe the turbo-prop with neat sketch.

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