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Code No: 136EB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, March/April - 2021

THERMAL ENGINEERING – II

(Mechanical Engineering)

Time: 3 Hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

- 1.a) Explain about the construction details of Lamont boiler with a neat sketch.
- b) A steam power plant is working based on Rankine cycle, in which the steam enters the turbine at 50 bar and 500°C and expanded upto 0.01 bar. If the mass flow rate of steam is 20 kg/s, then calculate (i) quality of steam at the exit of the turbine (ii) cycle efficiency (iii) net work output (iv) capacity of the plant. [7+8]
- 2.a) Define and derive the terms equivalent evaporation and boiler horse power.
- b) Determine the throat area, exit area and exit velocity for a steam nozzle to pass a mass flow of 0.3 kg/s when inlet conditions are 10 bar and 250°C and the final pressure is 2 bar. Assume expansion is isentropic and that the inlet velocity is negligible. Use $pv^{1.3} = \text{constant}$. [7+8]
- 3.a) Explain different types of compounding of impulse turbine and give examples.
- b) A DeLaval turbine is designed to operate to generate 40 MW of power. The steam enters the blades at nozzle angle of 20° with an absolute velocity of 300 m/s. If the blade velocity is 75 m/s, then calculate (i) blade work (ii) blade efficiency (iii) mass flow rate of steam. [6+9]
- 4.a) Explain about the working and construction details of Low-level jet condenser and High-level jet condenser.
- b) Define and derive the degree of reaction and show that its value is 0.5 for Parson turbine. [8+7]
- 5.a) What is super saturation of steam nozzles and discuss its effect on performance.
- b) Derive the condition for maximum blade efficiency of impulse turbine. [8+7]
- 6.a) What are the sources of air leakage in the steam condensers? How to control the leakage?
- b) A gas turbine is operated between the minimum temperature of 298 K and a maximum temperature of 1500 K. Then calculate (i) optimum pressure ratio (ii) net work output (iii) work ratio (iv) back work ratio and (v) capacity of the plant, if mass of air is 8 kg/s. [7+8]
- 7.a) What are the desirable characteristics for the good combustion chamber for the gas turbine? Explain.
- b) Describe the working of turbojet engine with a diagram and discuss its thermodynamic analyses. [7+8]
- 8.a) Explain different thrust augmentation techniques used for air breathing engines.
- b) Describe the solid propellant rocket with a diagram. [8+7]

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