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Code No: 115ER

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January/February - 2023

THERMAL ENGINEERING - II

(Mechanical Engineering)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	What is a chemical fuel? List some important secondary fuels.	[2]
b)	State the essential differences between Carnot and Rankine cycles	[3]
c)	How do accessories differ from mountings?	[2]
d)	What is the effect of friction on the flow through a steam nozzle?	[3]
e)	Write the expression for blade efficiency for a single stage reaction turbine for getting the maximum blade efficiency.	[2]
f)	What is High level Jet condenser?	[3]
g)	What do you mean by the term 'gas turbine'?	[2]
h)	What is the purpose of intercooling in gas turbine	[3]
i)	Classify the rockets.	[2]
j)	Define the terms thrust power and propulsion efficiency.	[3]

PART-B

(50 Marks)

2.a) Write short note on adiabatic flame temperature.

b) In a Rankine cycle, the steam at inlet to turbine is saturated at pressure of 30 bar and exhaust pressure is 0.25 bar. Determine (i) The pump work (ii) Turbine work (iii) Rankine efficiency (iv) Condenser heat flow (v) dryness at the end of expansion. Assume flow rate of 10 kg/s. [3+7]

OR

3.a) Enumerate the methods by which air-fuel ratio can be calculated when analysis of combustion products is known.

b) How is analysis of exhaust and flue gas carried out? [5+5]

4.a) Explain with the help of neat sketch simple vertical boiler.

b) Explain the boiler terms: (i) grate (ii) Scale (iii) lagging (iv) refractory. [5+5]

OR

5. Dry saturated steam at a pressure of 8bar enters a convergent divergent nozzle and leaves it at a pressure of 1.5 bar. If the flow is isentropic and the corresponding expansion index is 1.135. Find the ratio of cross sectional area at exit and throat for maximum discharge. [10]

6. Sketch the velocity diagram of a single stage impulse turbine and determine the expression for the force, work done, diagram efficiency and axial thrust. [10]

OR

7.a) Explain the reasons for inefficiency in surface condensers.

b) A single stage steam Turbine is supplied with steam at 5bar and 200^0C at the rate of 50Kg/min. It expands into a condenser at a pressure of 0.2bar. The blade speed is 400m/sec. The nozzles are inclined at an angle of 20^0 to the plane of wheel and outlet blade angle is 30^0. Neglecting friction losses. Determine the power developed, blade efficiency and stage efficiency. [5+5]

8.a) Derive the thermal efficiency of an ideal gas turbine power plant.

b) Write a short note on fuels used for gas turbines. [5+5]

OR

9.a) State the merits of gas turbine over I.C. engines and steam turbines.

b) Describe with neat diagram a closed cycle gas turbine. [5+5]

10.a) What is meant by thrust? Derive the thrust equation for a general propulsion system.

b) A turbojet is flying with a speed of 850 KMPH at an altitude, where air density is 0.17 kg/m^3. The propulsive and overall efficiencies are 55% and 17% respectively. If the drag on air craft is 6000 N, calculate the exit velocity of jet, diameter of jet and propulsive power. [5+5]

OR

11.a) State the fundamental differences between the jet propulsion and rocket propulsion.

b) Derive the expressions for thermal efficiency of thrust and thrust power. [5+5]

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