Code No: R1631035 **R16** SET - 1

III B. Tech I Semester Supplementary Examinations, May - 2019

THERMAL ENGINEERING – II

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**
4. Use of steam tables and Mollier chart is allowed

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PART –A

1	a)	What are the methods which can lead to increase in thermal efficiency of rankine cycle?	[2M]
	b)	What is the function of a fusible plug and an air pre heater?	[3M]
	c)	Define vacuum efficiency and explain how it is useful in condensers.	[2M]
	d)	What is the main difference between impulse and reaction turbines?	[3M]
	e)	List the applications of gas turbines.	[2M]
	f)	What are the types of jet propulsion systems?	[2M]

PART –B

2	a)	Explain the working and analysis of regenerative rankine cycle with one feed water heater.	[7M]
	b)	In a Rankine cycle the steam at inlet to turbine is saturated at a pressure of 35bar and exhaust pressure is 0.2bar. Determine (i) The pump work (ii) The turbine work (iii) The Rankine efficiency (iv) The condenser heat flow (v) The dryness fraction at the end of expansion. Take a flow rate of 10kg/sec.	[7M]
3	a)	Compare the merits and demerits of water tube and fire tube boilers.	[7M]
	b)	In an experiment on a small oil fired boiler the steam produced is at 6 bar gauge. The quality of steam produced is found out to be 0.96 dry. 75 litres of water is converted into steam in 9.5 minutes. The fuel is a light diesel oil with specific gravity of 0.85 and calorific value of 43125 kJ/kg. 10 liters of oil is consumed in 11 mintues and 25 seconds. The feed water temperature is 35^{o}C. Determine the boiler efficiency. Take atmospheric pressure as 1 bar.	[7M]
4	a)	The velocity of steam leaving nozzles of an impulse turbine is 900m/s and the nozzle angle is 20^{0}. Blade velocity is 300m/s and blade velocity coefficient is 0.7. Calculate for a mass flow rate of 1kg/Sec and symmetrical blading (i) The blade inlet angle (ii) Driving force on wheel (iii) The axial thrust (iv) Diagram power (v) Diagram efficiency.	[7M]
	b)	What is the effect of friction on the flow through a steam nozzle? Explain with help of h-s diagram.	[7M]
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5 a) Explain the working of an evaporative condenser with a sketch. [7M]

b) A reaction turbine runs at 3000 rpm and the steam consumption is 20000 kg/hr. The pressure of steam at a certain pair is 2 bar, its dryness fraction is 0.93 and the power developed by the pair is 50 kW. The discharge blade angle is 20^{o} for both the fixed and moving blades and the axial velocity of flow is 0.72 times the blade velocity. Find the drum diameter and the blade height. Take the tip leakage steam as 8%. Neglect blade thickness. [7M]

6 a) Describe with neat sketch the working of a simple constant pressure open cycle gas turbine. [7M]

b) A gas turbine unit receives air at 100 kPa and 300 Kelvin and compresses it adiabatically to 620 kPa with efficiency of the compressor 88%. The fuel has a heating value of 44180 kJ/kg and the fuel/air ratio is 0.017. The turbine internal efficiency is 90%. Calculate the compressor work, turbine work and thermal efficiency. [7M]

7 a) Explain the applications of rockets. [7M]

b) A turbo jet engine consumes air at the rate of 60.2 kg/s when flying at a speed of 1000 km/hr. Calculate (i) Fuel flow rate in kg/s, when air fuel ratio is 70:1 (ii) propulsive power (iii) propulsive efficiency. [7M]

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