Code No: 115ER

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, March - 2017
THERMAL ENGINEERING – II
(Common to AME, ME)

Time: 3 hours   Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A
(25 Marks)

1.a)	Explain the classification of fuels.	[2]
b)	Explain regenerative cycle with neat sketch.	[3]
c)	Differences between external fired and internal fired boilers.	[2]
d)	State differences between high-pressure and low pressure boilers?	[3]
e)	Draw velocity triangle for 50% reaction steam turbine.	[2]
f)	Discuss the merits and demerits of surface condensers over jet condensers.	[3]
g)	Write briefly about the usage of gas turbines.	[2]
h)	Distinguish between an ideal gas turbine plant and an actual gas turbine plant.	[3]
i)	List out the factors which are to be considered for the comparison of different types of rockets?	[2]
j)	List out the desirable properties required for liquid propellant rockets.	[3]

PART - B
(50 Marks)

2.a) What are the advantages and disadvantages of regenerative cycle over simple Rankine cycle?

 b) Percentage composition of sample of liquid fuel by weight is, C=88.8% and H_2 = 15.2% Calculate i) the weight of air needed for combustion of 1kg of fuel, ii) the volumetric composition of product of combustion if 15% excess air supplied. [5+5]

OR

3.a) Compare Rankine cycle and Carnot cycle.

 b) Calculate the height of a chimney required to produce a draught equivalent to 1.7cm of water if the flue gas temperature is 270^0C and ambient temperature is 22^0C and minimum amount of air per kg of fuel is 17kg. [5+5]

4.a) Explain with help of neat diagrams, Cochran boiler, fire tube boilers.

 b) Explain with the help of neat diagram Lancashire boiler. [5+5]

OR

5.a) What is the effect of friction on nozzle.

 b) Distinguish between water-tube and fire-tube boilers and state under what circumstances each type would be desirable. [5+5]

6.a) What are the types of Condensers? Classify.

b) A single-row impulse turbine develops 132.5 kW at a blade speed of 175 m/s when the steam flow rate is 120 kg/min. Steam leaves the nozzle at 400 m/s. Take blades velocity coefficient = 0.9 and assume that the steam leaves the turbine blades axially. Find out the nozzle angle, blade angles. Assume there is no shock. [5+5]

OR

7.a) Explain working principle of Surface Condenser with neat sketch.

b) A closed vessel of 0.7 m^3 capacity contains saturated water vapor and air at a temperature of 42.7 ^{0}C and a pressure of 0.13 bar abs. Due to further air leakage into the vessel, the pressure rises to 0.28 bar abs. and temperature falls to 37.6 ^{0}C. Calculate the mass of air which has leaked in. Take R=287J/kg K for air. [5+5]

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

b) A gas turbine unit receives air at 100kPa and 300K and compresses it adiabatically to 620kPa with efficiency of the compressor 88%. The fuel has a heating value of 44,180kJ/kg and the fuel/air ratio is 0.017kg fuel/kg air. The turbine internal efficiency is 90%. Calculate the compressor work, turbine work and thermal efficiency. [5+5]

OR

9.a) Explain the effect of regeneration, inter cooling, and reheating on the performance of Gas turbine plant.

b) A gas turbine plant receives air at 1 bar and 290K and compresses it to 5bar. If the temperature of air after compression is 1000K. Find the thermal efficiency of the turbine. Take γ=1.4 for air. [5+5]

10.a) State the fundamental difference between the jet propulsion and rocket propulsion.

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

OR

11.a) Explain the principle and working of liquid propellant rocket engine with neat sketch.

b) A jet plane having 2 jets works on turbo-jet system. It flies at a speed of 800km/hr at an altitude where density of air is 0.15 kg/m^3. The propulsive efficiency is 55%. The drag on the plane is 6500N. Calculate i) Absolute velocity of jet ii) quantity of compressed air and iii) diameter of jet. [5+5]

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