Code No: RT31035 **R13** SET - 1

III B. Tech I Semester Supplementary Examinations, October/November - 2018

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**
(Use of steam tables and Mollier chart is allowed)

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PART –A

1 a) What do you understand by mean temperature of heat addition? [4M]

b) Explain `Boiler Draught`? [3M]

c) Explain the principle involved in calculation of the velocity with which fluid issues from a nozzle assuming frictionless adiabatic flow. [4M]

d) Differentiate between Impulse and Reaction turbines. [4M]

e) Discuss the relative advantages and disadvantages of reciprocating I.C. engines and gas turbines. [3M]

f) What is meant by thrust augmentation? Explain. When it is necessary? [4M]

PART -B

2 a) What is adiabatic flame temperature? How flame temperature can be calculated? [7M]

b) A power generating plant uses steam as a working fluid and operates at a boiler pressure of 80 bar and a condenser pressure of 0.075 bar. Assuming the operating cycle to be ideal, determine i) The heat transfer per unit mass of steam in the boiler and condenser; ii) The specific work output; iii) The cycle efficiency; iv) The required rate of steam flow to provide a specified power output of 10000 kW and v) Work ratio if the plant operates on The Rankine cycle, taking the pumping work into account. [9M]

3 a) What do you mean by high pressure boilers? How do they differ in construction and working from an ordinary boiler? [7M]

b) Describe briefly the advantages which you would expect to be gained from incorporating economizer, air pre-heater and a super heater in a steam plant. By a line diagram, indicate the position of these accessories in a typical boiler plant. [9M]

4 a) Describe the changes which occur in pressure and velocity distribution along the length of a i) convergent nozzle ii) convergent-divergent nozzle, as the back pressure is reduced slowly from inlet pressure to below designed back pressure. [8M]

b) Find the optimum ratio of blade speed to steam speed for a two-stage velocity-compounded impulse turbine. How diagram efficiency varies with blade-steam velocity ratio with the increase in number of stages? [8M]

5 a) Explain the working of a single-stage reaction turbine. Sketch pressure and velocity variations along the axis of the turbine. Show the expansion on h-s chart. [8M]

b) The vacuum at the bottom of a surface condenser is 65.4 cm of mercury (barometer 75.7cm), the temperature at the air pump suction is 36.2^{0}C. If the rate of air leakage into the condenser is 1kg per 1000 kg of steam, estimate the mass of air and vapour removed by the air pump per minute when the engine consumption is 136000 kg of steam/hr. [8M]
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6 a) Show with a sketch that closed cycle gas turbine plant is similar to steam turbine plant. [8M]

b) Discuss about types of gas turbine combustion chambers. [8M]

7 a) Describe with a sketch a solid propellant rocket. What is gain? What are the applications of solid propellant rockets? [8M]

b) The effective jet exit velocity of a rocket is 3500 m/s, the forward flight velocity is 1250 m/s, and the propellant consumption is 75 kg/s. Calculate: i) The thrust; ii) The thrust power and iii) The propulsive efficiency. [8M]

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