

Code No: **R1631035**

R16

SET - 1

III B. Tech I Semester Supplementary Examinations, August - 2021

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. Answer **ALL** the question in **Part-A**

3. Answer any **FOUR** Questions from **Part-B**

Data Book allowed

PART -A

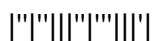
(14 Marks)

1. a) Draw a T-S diagram for Rankine cycle and represent all the process involved. [2M]
- b) What is meant by boiler draught? [2M]
- c) What is the condition for maximum discharge of a nozzle? [2M]
- d) What is the difference between a turbine and a condenser? [3M]
- e) Define combustion. [2M]
- f) Write the principle of jet propulsion and classify the Jet propulsive engines. [3M]

PART -B

(56 Marks)

2. a) Explain regeneration cycle with the help of T-S plot. [4M]
- 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: [10M]
(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. a) Why mountings are essential in boilers? Name different mountings and give functions of each. [7M]
- b) A steam generator evaporates 1800 kg/h of steam at 12.5 bar and a quality of 0.97 from feed water at 1050° C, when coal is fired at the rate of 2040 kg/h. If the higher calorific value of the coal is 27400 kJ/kg, find: [7M]
i) Equivalent Evaporation and; ii) Thermal Efficiency.
4. a) Write the general energy equation for a steady flow system and from this obtain the energy equation for nozzle. State clearly the assumptions made. [7M]
- b) Dry saturated steam at 9 bar is expanded in a nozzle to 0.5 bar. The throat area is 6.5 cm and the inlet velocity is negligible. Estimate the mass flow and the exit area. Assume isentropic flow and take the index $n=1.125$ for dry saturated steam. [7M]



5. a) Explain the working of single stage reaction turbine. Sketch the pressure and velocity variations along the axis of the turbine. [6M]
b) In a surface condenser the vacuum reading is 715 mm of Hg. The barometric reading is 758 mm of Hg. The amount of air leakage in the condenser amounts to 5 kg/hr. The temperature at inlet to the air cooler section is 30°C and at the outlet is 27°C. Calculate: [8M]
i) mass of steam condensed in the air cooler section
ii) Reduction in the air pump capacity following the cool air.
6. a) Explain about the open cycle and closed cycle turbines with neat sketches and also draw P-V and T-S diagrams. [6M]
b) In a simple gas turbine plant, air enters at 1 bar and 20°C and compressed with isentropic efficiency of 80% to 4 bar. Then it is heated in combustion chamber with A:F ratio=90:1. The Calorific value of a fuel used is 41.8 MJ/kg. If air flow is 3 kg/sec, find the power developed and thermal efficiency by the plant. Take $C_p = 1 \text{ kJ/kg}^\circ\text{C}$ and $\gamma = 1.4$ for air as well as gas. [8M]
7. a) What is meant by thrust augmentation? When it is necessary? Describe any one method of thrust augmentation. [6M]
b) A turbo jet engine consumes air at the rate of 48 kg/s when flying at a speed of 950 km/hr. Calculate: [8M]
i) Fuel flow rate in kg/s, when air fuel ratio is 60:1
ii) propulsive power
iii) propulsive efficiency.

