Code No: **20ME3T05** **R20**

II B. TECH II SEMESTER REGULAR EXAMINATIONS, JUNE - 2022
THERMAL AND HYDRO PRIME MOVERS
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours Max. Marks: 70

Note: Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**

UNIT-I

1. a) Explain Joule's experiment with a neat sketch. [7M]
   b) At the inlet to a certain nozzle the enthalpy of a fluid passage is 2800kJ/kg and the velocity is 50m/s. At the discharge end the enthalpy is 2600kJ/kg. The nozzle is horizontal and there is negligible heat loss from it. (i) Find the velocity at the exit of the nozzle? (ii) If the inlet area is 900 cm^2 and the specific volume at inlet is 0.187 m^3/kg. Find the mass flow rate? [7M]

(OR)

2. a) The shape of the Carnot cycle on T-S plot is square. Justify. [7M]
   b) In a turbo machine handling an incompressible fluid with a density of 1000 kg/m^3 the conditions of the fluid at the rotor entry and exit are as given in the table. If the volume flow rate of the fluid is 40 m^3/s, estimate the net energy transfer from the fluid as work. [7M]

	Inlet	Exit
Pressure	1.15Mpa	0.05Mpa
Velocity	30m/sec	15.5m/sec
Datum	10m	2m

UNIT-II

3. a) Compare the relative advantages and disadvantages of four-stroke and two-stroke cycle engines. [7M]
   b) A cyclic heat engine operates between a source temperature of 800^0C and a sink temperature of 30^0C. Estimate the least rate of heat rejection per kW net output of the engine. [7M]

(OR)

4. a) List out the advantages of internal combustions engines over gas turbines. [7M]
   b) Describe with neat sketches the working of a simple constant pressure open cycle gas turbine. [7M]

UNIT-III

5. a) With a neat sketch explain the working of closed cycle gas turbine plant. [7M]

b) A single stage steam Turbine is supplied with steam having enthalpy 2850kJ/kg and steam leaves with enthalpy 2340kJ/kg at the rate of 50kg/min. 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 and blade efficiency by graphical method. [7M]

(OR)

6. a) Illustrate the concept of pressure compounding. [7M]

b) The velocity of steam exiting the nozzle of the impulse stage of a turbine is 400 m/s. The blades operate close to the maximum blade efficiency. The nozzle angle is 20^0. Considering equiangular blades and neglecting blade friction. Estimate the diagram power and diagram efficiency for the steam flow of 0.6 kg/s. [7M]

UNIT-IV

7. a) Frame an expression for rate of flow through venturimeter. [7M]

b) Define fluid and explain different types of fluids. [7M]

(OR)

8. a) Deduce an expression for Bernoulli's equation from Euler's equation. [7M]

b) A horizontal venturimeter with inlet and throat diameters 30cm and 15cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20cm of mercury. Determine the rate of flow.

Take C_d=0.98. [7M]

UNIT-V

9. a) Enumeration the classifications of hydraulic turbines. [7M]

b) Describe with a sketch the installation and operation of a centrifugal pump. [7M]

(OR)

10. a) List out the advantages and disadvantages of hydraulic turbines over steam turbines. [7M]

b) A Kaplan turbine runner is to be designed to develop 9100KW. The net available head is 5.6m. If the speed ratio 2.09, flow ratio 0.68 and overall efficiency 86%. Estimate blade velocity and discharge through the turbine. [7M]

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