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Bengaluru

Mid Term Examinations - October 2026

Date: 07/10/2026 **Time:** 02:00 PM - 03:30 PM

Course Code: MEC2501 **Course Name:** Basic Thermodynamics

Semester: Third Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO3
Marks	48	68	64

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	Define and explain thermodynamic system with sketch.	2	CO1	BT1
2	Define work in thermodynamics point of view with example.	2	CO1	BT1
3	Differentiate between intensive and extensive properties with an example of each.	2	CO2	BT1
4	State the First Law of Thermodynamics for a closed system executing a cyclic process both in words and in equation form.	2	CO3	BT1
5	Define flow work in an open control volume and express it mathematically in terms of fluid properties.	2	CO3	BT1

PARTB: Answer Any 1 Following Questions. 20 M

Q.N.	Questions	M	CO	BT
06.A	A piston cylinder device operates 1 kg of fluid at 10 atm. Pressure. The initial volume is 0.07 m3. The fluid is allowed to expand reversibly following a process pV1.34 = constant so that volume becomes Triple. The fluid is then cooled at constant pressure until piston comes back to original position. Keeping the piston unaltered, heat is added reversibly to restore it to the initial pressure. Calculate the work done in the cycle.	10	CO2	BT3
06.B	(i) Compare the macroscopic and microscopic points of view in thermodynamic analysis, detailing their assumptions, dependent variables, and primary engineering applications. (ii) Define complete thermodynamic equilibrium and explain the physical conditions required for thermal, mechanical, phase, and chemical equilibria.	10	CO1	BT2
07.A	A gas is compressed polytropically from 1 bar and 0.8 m^3 to 5 bar and 0.2 m^3. Determine: The polytropic index The work done during the process.	10	CO2	BT3
07.B	Define a quasi-equilibrium (quasi-static) process and explain why non-equilibrium processes cannot be plotted as continuous lines on property diagrams. Distinguish between a thermodynamic process and a thermodynamic cycle.	10	CO1	BT2

PARTC: Answer Any 1 Following Questions. 20 M

Q.N.	Questions	M	CO	BT
08.A	Derive the steady flow energy equation for Nozzle and diffuser. Also explain what are the nozzle and diffuser.	10	CO2	BT3

08.B	Steam flows steadily through an adiabatic turbine. The inlet conditions are an enthalpy of and a velocity of 50 m/s . The exit conditions are an enthalpy of 2600 kJ and a velocity of 100 m/s. The mass flow rate of the steam is 10 kg/s, and the change in potential energy is negligible. Determine the kinetic energy terms at the inlet and exit in kJ/kg and calculate the total power output of the turbine in kW and MW .	10	CO3	BT3
09.A	Air flows steadily at the rate of 0.5 kg/s through an air compressor, entering at 7 m/s velocity, 100 kPa pressure, and 0.95 m^3/kg volume, and leaving at 5 m/s, 700 kPa, and 0.19 m^3/kg. The internal energy of the air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in the compressor jackets absorbs heat from the air at the rate of 58 kW. (a)Compute the rate of shaft work input to the air in kW, (b) Find the ratio of the inlet pipe diameter to outlet pipe diameter.	10	CO2	BT3
09.B	Steam enters a well-insulated, horizontal turbine steadily at an enthalpy of 3400 kJ/kg with a velocity of 60 m/s. The exit state conditions are measured as h2 = 2400 kJ/kg and V2 = 120 m/s. The mass flow rate of steam through the turbine is 8 kg/s. Potential energy changes are negligible. Determine the kinetic energy terms per unit mass at the inlet and exit in kJ/kg and calculate the total power developed by the turbine in both kW and MW.	10	CO3	BT3