CBCS SCHEME - Make-Up Exam

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BAU304

Third Semester B.E/B.Tech. Degree Examination, June/July 2025
Engineering Thermodynamics

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Use of Thermodynamics Data Hand Book charts is allowed.

		Module – 1	M	L	C
1	a.	Define : i) Thermodynamic process ii) Thermodynamic cycle. iii) Path and point functions Represent the same graphically.	10	L1	CO1
	b.	Construct a new temperature scale OM in which boiling and freezing point of water are respectively 700°m and 100°m. Co-relate this scale with centigrade scale.	10	L2	CO2
		OR			
2	a.	Discuss the following types of work : (i) Shaft work (ii) Electrical work, representing with suitable equations.	10	L1	CO1
	b.	If perfect gas undergoes a process as per the law $T\alpha\left(\frac{1}{V^{2.5}}\right)$. Find out the workdone during compression from 10 bar, 4 m^3 to a final state of 2 m^3. Also find the final pressure.	10	L2	CO2
		Module – 2			
3	a.	Derive steady flow energy equation for an open system. State the assumptions made.	10	L2	CO2
	b.	In a steady flow system, a working fluid flows at 220 kg/min rejecting 100 kJ/s of heat. The inlet and outlet conditions are v_1 = 0.36 m^3/kg, p_1 = 6 bar, V_1 = 220 m/s, u_1 = 2000 kJ/kg and v_2 = 1.3 m^3/kg, p_2 = 1.2 bar, V_2 = 140 m/s and u_2 = 1400 kJ/kg. Determine the power capacity of the system in MW.	10	L3	CO3
		OR			
4	a.	State the Kelvin-Plank and Clausius hypothesis of second law of thermodynamics. Prove their equivalence.	10	L2	CO2
	b.	Sketch and explain the concept of perpetual motion machines, PMM-1 and PMM-II. Describe how do they violate the laws of thermodynamics.	10	L3	CO3
		Module – 3			
5	a.	Define available and unavailable energy. Assuming a compression process 1 – 2 on a T-S diagram, represent the available and unavailable energy.	10	L2	CO2

	b.	Define entropy and show that entropy is a property.	10	L3	CO3
		OR			
6	a.	Define the following : (i) Critical point of water (ii) Triple point of water (iii) Superheated vapour. On a P-T diagram for water, show fusion line, vapourization line and the above three points.	10	L2	CO2
	b.	A spherical shell of 1 m diameter, at 250 °C contains equal volumes of saturated steam and water. If the specific volumes of liquid and gas respectively are 0.001251 m^3/kg and 0.05013 m^3/kg, find the mass of liquid and gas.	10	L3	CO3
		Module – 4			
7	a.	Describe with a schematic diagram a vapour compression refrigeration system. Analyze for COP and refrigerating effect.	10	L3	CO3
	b.	A 15 kW vapour compression system has 178 kJ/kg of heat at saturated condition leaving the evaporator. The compressor and condenser exit record 210 kJ/kg and 60 kJ/kg of heat. Determine (i) COP of the cycle (ii) Refrigerant mass flow rate (iii) Power input to the compressor.	10	L4	CO4
		OR			
8	a.	Define the following terms and write appropriate equations to represent them : (i) Specific humidity (ii) Humidity ratio (iii) Wet bulb temperature (iv) Dew point temperature.	10	L2	CO3
	b.	At a location, air has 40 °C DBT and 28 °C WBT at a total pressure of 1.01325 bar. Determine : (i) Specific humidity (ii) Relative humidity (iii) Dew point temperature. Take gas constant for air and vapour as 0.287 kJ/kgK and 0.461 kJ/kgK.	10	L4	CO4
		Module – 5			
9	a.	Derive an expression for thermal efficiency of a Petrol engine cycle in terms of volume compression ratio.	10	L3	CO2
	b.	A Carnot cycle has operating temperature limits 300 °C and 27 °C, with a volume expansion ratio of 16. Determine (i) The volume ratio of isothermal and adiabatic processes (ii) Thermal efficiency of the cycle. For air $\gamma = 1.4$	10	L4	CO4
		OR			
10	a.	Sketch and explain the working of a Prony-brake dynamometer.	10	L2	CO2
	b.	A four stroke four cylinder petrol engine develops 14.7 kW. Records show that the power developed with first, second, third and fourth cylinder when individually cut off are 10.1 kW, 10.3 kW, 10.4 kW and 10.2 kW respectively. Using the Morse test concept, determine the indicated power and mechanical efficiency of the engine.	10	L4	CO4