Sanjay Ghodawat University, Kolhapur 2018-19

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Year and Program: 2018-19 **School of Technology** **Department of Mechanical Engg.**
SY B. Tech. (Mechanical)
Course Code: MET207 **Course Title: Thermodynamics** **Semester – III**
Day and Date:-4/12/12018 **End Semester Examination** **Time:** **Max Marks: 100**
Tuesday **(ESE)** 2:30 pm to 5:30 pm

Instructions: 1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.

		Marks	Bloom's Level	CO
Q.1	**Solve any Two**			
a)	Define a thermodynamic system. Differentiate between open system, closed system and an isolated system. **(Question From Unit 1)**	05	L_2	CO1
	OR			
a)	What do you mean by Thermodynamic equilibrium? Explain briefly. **(Question From Unit 1)**	05	L_2	CO1
b)	What do you understand by point function and path function? Explain with the help of suitable example. **(Question From Unit 1)**	05	L_2	CO1
	OR			
b)	Give similarities & dissimilarities of Heat and Work. **(Question From Unit 1)**	05	L_2	CO1
Q.2	**Solve any Two**			
a)	Define 'Internal energy' and prove that it is a property of a system. **(Question From Unit 2)**	05	L_3	CO2
	OR			
a)	State Assumptions made while Deriving the steady flow energy equation (S.F.E.E.) and Derive S.F.E.E. **(Question From Unit 2)**	05	L_3	CO2

b) A fluid system, contained in a piston and cylinder machine, passes through a complete cycle of four processes. The sum of all heat transferred during a cycle is – 340 kJ. The system completes 200 cycles per min. 05 L_3 CO2

Complete the following table showing the method for each item, and compute the net rate of work output in kW.

Process)	Q (kJ/min	W (kJ/min)	ΔE (kJ/min)
1—2	0	4340	—
2—3	42000	0	—
3—4	– 4200	—	– 73200
4—1	—	—	—

(Question From Unit 2)

OR

b) A turbine, operating under steady-flow conditions, receives 4500 kg of steam per hour. The steam enters the turbine at a velocity of 2800 m/min, an elevation of 5.5 m and a specific enthalpy of 2800 kJ/kg. It leaves the turbine at a velocity of 5600 m/min, an elevation of 1.5 m and a specific enthalpy of 2300 kJ/kg. Heat losses from the turbine to the surroundings amount to 16000 kJ/h. 05 L_3 CO2

Determine the power output of the turbine. **(Question From Unit 2)**

Q.3 **Solve any Two**

a) Explain Equivalence of Kelvin-Plank and Clausius statements. 05 L_2 CO3

(Question From Unit 3)

OR

a) Define & Compare heat engine, refrigerator and heat pump. 05 L_2 CO3

(Question From Unit 3)

	b)	A heat engine receives heat at the rate of 1500 kJ/min and gives an output of 8.2 kW. Determine : (i) The thermal efficiency; (ii) The rate of heat rejection. **(Question From Unit 3)**	05	L_3	CO3
		OR			
	b)	An inventor claims that his engine has the following specifications : Temperature limits ..... 750°C and 25°C Power developed ..... 75 kW Fuel burned per hour ..... 3.9 kg Heating value of the fuel ..... 74500 kJ/kg State whether his claim is valid or not. **(Question From Unit 3)**	05	L_3	CO3
Q.4		**Solve any Two**			
	a)	Define Entropy and Prove that entropy is a property of a system. **(Question From Unit 4)**	05	L_2	CO4
		OR			
	a)	State and Prove Clausius inequality **(Question From Unit 4)**	05	L_3	CO4
	b)	State & prove the Principle of Increase of Entropy **(Question From Unit 4)**	05	L_3	CO4
		OR			
	b)	1.2 m^3 of air is heated reversibly at constant pressure from 300 K to 600 K, and is then cooled reversibly at constant volume back to initial temperature. If the initial pressure is 1 bar, calculate : The overall change in entropy. Represent the processes on T-S plot. Take cp = 1.005 kJ/kg K and R = 0.287 kJ/kg K **(Question From Unit 4)**	05	L_3	CO4
Q.5		**Solve any Three**			
	a)	What are primary & secondary fuels? List some important primary & secondary fuels. **(Question From Unit 5)**	10	L_2	CO5

	b)	Define heating value of fuel. What is the difference between higher heating value (HHV) and lower heating value (LHV) of the fuel? **(Question From Unit 5)**	10	L_2	CO5
	c)	Write Short Note on **any two** of following • Classification of Jet Propulsion Engines • Turbojet Engine • Rocket Engine **(Question From Unit5)**	10	L_2	CO5
	d)	How is analysis of exhaust and flue gas carried out? **(Question From Unit 5)**	10	L_2	CO5
Q.6		**Solve any Three**			
	a)	State Boyle's law, Charles law, and Avogadro's law and prove the characteristic gas equation. **(Question From Unit 6)**	10	L_2	CO6
	b)	Explain following Terminologies of pure substance, 1. Saturation States 2. Triple Point 3. Critical State 4. Dryness fraction 5. Sensible & Latent Heat **(Question From Unit 6)**	10	L_2	CO6
	c)	Draw the phase equilibrium diagram on p-v, coordinates for a pure substance which shrinks in volume on melting and then for a substance which expands in volume on melting. Indicate thereon relevant constant property lines **(Question From Unit 6)**	10	L_2	CO6
	d)	Draw and explain the phase equilibrium diagram of a pure substance on T-s and h-s plot with relevant constant property lines **(Question From Unit 6)**	10	L_2	CO6

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