Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI EXAMINATION – WINTER 2025

Subject Code:3161910 Date:02-12-2025

Subject Name:Applied Thermodynamics

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1*	**(a)**	Define brake power, indicated power and brake specific fuel consumption.	**03**
	(b)	Derive equation of constants employed in Vander Waal's equation.	**04**
	(c)	Prove that velocity of sound wave is the square root of the ratio of the change in pressure to the change in density of a fluid due to disturbance in compressible flow.	**07**
Q.2	**(a)**	Enlist various desirable properties of good refrigerant.	**03**
	(b)	Give classification of compressors.	**04**
	(c)	Explain construction and working of Li-Br Vapour Absorption System with neat sketch.	**07**
		OR	
	(c)	In a cooling application, air at 32^{o}C DBT and 20^{o}C WBT is passed through a cooling coil maintained at 5^{o}C. The heat removed by the cooling coil from air is 14 kW and air flow rate is 42.5 m^{3}/min. Determine (i) DBT and WBT of the air leaving the coil, (ii) coil by-pass factor.	**07**
Q.3	**(a)**	Give difference between Euro norms Bharat stage emission norms.	**03**
	(b)	Explain chemical dehumidification process.	**04**
	(c)	What is loss due to dissociation? Explain effect of dissociation on temperature and power in engine.	**07**
		OR	
Q.3	**(a)**	The COP of a refrigerator is 6, when it maintains the temperature of -3^{o}C in the evaporator. Determine the condenser temperature and refrigerating effect if the power required to run the refrigerator is 7.5 kW.	**03**
	(b)	Explain actual cycle for SI engine with p-v diagram.	**04**
	(c)	Write short note on heat balance sheet.	**07**
Q.4	**(a)**	What is the need of multi-staging in reciprocating compressor?	**03**
	(b)	Explain Exhaust Gas Recirculation System with neat Sketch.	**04**

	(c)	The following details were noted in a test on a 4-cylinder, 4-stroke engine: cylinder diameter = 100 mm ; stroke length = 120 mm ; speed of the engine = 1600 rpm ; fuel consumption = 0.2 kg/min ; CV of the fuel = 44000 kJ/kg ; difference in tension tension on either side of the brake pulley = 40 kg ; brake circumference is 300 cm. If the mechanical efficiency is 80 % calculate, brake and indicated thermal efficiency , indicated mep, brake specific fuel consumption.	**07**

OR

Q.4	**(a)**	Define compressible and incompressible flow.	**03**
	(b)	Explain the phenomenon of surging and stalling in an axial flow compressor.	**04**
	(c)	Explain various losses in centrifugal compressor.	**07**
Q.5	**(a)**	Explain effect of pre- whirl in centrifugal compressor.	**03**
	(b)	Explain Propagation of Pressure Waves Distribution in a Compressible Fluid with neat Sketch.	**04**
	(c)	Explain with neat Sketch Effect of Impeller Blade Shape on Performance in Centrifugal Compressor.	**07**

OR

Q.5	**(a)**	Explain Mach angle and Mach cone.	**03**
	(b)	Explain designation system of refrigerants.	**04**
	(c)	Explain the use of aerofoil blading in axial flow compressor.	**07**

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