Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2022

Subject Code:3161910 Date:01/06/2022

Subject Name:Applied Thermodynamics

Time:10:30 AM TO 01:00 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)**	Explain Dalton's law of partial pressure. How evaporation happens in atmosphere?	**03**
	(b)	Define the following terms: (a) Stagnation temperature (b) Stagnation velocity of sound (c) Mach number (d) Stagnation Pressure	**04**
	(c)	Briefly explain the following with *p-V* diagram (i) Time loss factor (ii) Heat loss factor (iii) Exhaust blowdown factor	**07**
Q.2	**(a)**	How ODP and GWP does affect refrigerant selection?	**03**
	(b)	Explain in brief reduced properties of gas and critical compressibility factor.	**04**
	(c)	What is the effect of compressibility on Mach number? Prove for Υ =1.4 $$\frac{P_O - P}{\frac{1}{2}\rho V^2} = 1 + \frac{M^2}{4} + \frac{M^4}{40} + \ldots\ldots\ldots..$$	**07**
		OR	
	(c)	Derive the following from one dimensional steady flow energy equation and also explain various regions of flow based on it: $$\frac{a^2}{\gamma - 1} + \frac{V^2}{2} = \frac{a_o^2}{\gamma - 1} = \frac{V_{max}^2}{2} = \frac{a^{*2}}{2}\frac{\gamma + 1}{\gamma - 1} = h_o$$	**07**
Q.3	**(a)**	Define refrigerant for Vapor Compression Refrigeration (VCR) cycle and list desirable properties of good refrigerant.	**03**
	(b)	Define the following: (i) Absolute humidity (ii) Dry bulb temperature (iii) Dew point temperature (iv) Wet bulb temperature	**04**
	(c)	Explain with neat sketch flash intercooling. What are the advantages of it?	**07**
		OR	
Q.3	**(a)**	How will you assign number to the refrigerants: Dichloro difluoro methane and dichloro tetra fluoro ethane?	**03**

	(b)	Explain humidification and dehumidification process with the help of psychrometric charts.	**04**
	(c)	Explain working of Li-Br vapour absorption refrigeration system with neat sketch.	**07**
Q.4	**(a)**	Difference between Euro norms and Bharat stage norms.	**03**
	(b)	How do the specific heat vary with temperature? What is the physical explanation for this variation?	**04**
	(c)	A four cylinder engine running at 1200 rpm delivers 20 kW. The average torque when one cylinder was cut is 110 Nm. Find the indicated thermal efficiency if the calorific value of the fuel is 43 MJ/kg and the engine uses 360 grams of gasoline per kWh.	**07**

OR

Q.4	**(a)**	Define (1) Thermal efficiency (2) Indicated power (3) Mechanical efficiency.	**03**
	(b)	What is the difference between air standard cycle and fuel-air cycle analysis?	**04**
	(c)	A six cylinder, gasoline engine operates on the four stroke cycle. The bore of each cylinder is 80mm and the stroke 100 mm. the clearance volume per cylinder is 70 cc. at a speed of 4000 rpm the fuel consumption is 20 kg/h and the torque developed is 150 Nm. Calculate (i) the brake power (ii) brake mean effective pressure (iii) brake thermal efficiency if the calorific value of the fuel is 43000 kJ/kg.	**07**
Q.5	**(a)**	Explain effect of pre- whirl in centrifugal compressor.	**03**
	(b)	Explain the phenomenon of surging and stalling in an axial flow compressor.	**04**
	(c)	Show that for a two-stage reciprocating air compressor with complete intercooling the total work of compression becomes minimum when the pressure ratio in each stage is equal.	**07**

OR

Q.5	**(a)**	What do you mean by life and drag?	**03**
	(b)	Explains the Influence of inlet and outlet blade angles on the performance of centrifugal compressor.	**04**
	(c)	With usual notations derive an expression for indicated work of reciprocating air compressor by considering clearance.	**07**

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