Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–I & II(OLD) EXAMINATION – WINTER 2022
Subject Code:110006   **Date:03-03-2023**
Subject Name:Elements of Mechanical Engineering
Time:10:30 AM TO 01:00 PM   **Total Marks:70**
Instructions:
1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	An ideal gas is heated from 25˚C to145˚C. The mass of gas is 2 kg. Determine (i) Specific heats (ii) change in internal energy, (iii) change in enthalpy. Assume R = 267 J/Kg K and γ =1.4 for the gas.	**07**
	(b)	Describe in brief the various non-ferrous metals along with their applications.	**07**
Q.2	**(a)**	Derive the Carnot efficiency of vapour. Draw P-V diagram for the Carnot vapour cycle	**07**
	(b)	With neat sketch explain the working of window Air Conditioner.	**07**
Q.3	**(a)**	In an air standard Otto cycle the maximum and minimum temperatures are 1400˚C and 15˚C. The heat supplied per kg of air is 800 kJ. Calculate the compression ratio and cycle efficiency. Also calculate the ratio of maximum to minimum pressures in the cycle	**07**
	(b)	Explain with neat figure, the construction of Cochran Boiler	**07**
Q.4	**(a)**	Classify heat engines and pumps.	**07**
	(b)	A cylinder 2 stroke engine develops 30 kW at 2500 rpm. The mean effective pressure of each cylinder is 800 kPa and mechanical efficiency = 80%. Calculate brake power and mass flow rate of fuel if L/D =1.5, Brake thermal efficiency = 28% and calorific value of fuel = 44000kJ/kg.	**07**
Q.5	**(a)**	Compare (i) Two stroke and Four stroke engine (ii) brake and clutch.	**07**
	(b)	Derive the expression of work done by a single stage single acting reciprocating air compressor neglecting clearance volume. Consider adiabatic process for expansion of air.	**07**
Q.6	**(a)**	Specify the types of centrifugal pumps and explain any one in detail.	**07**
	(b)	Classify the types of couplings and with neat figure, discuss the working of any coupling of your choice.	**07**
Q.7	**(a)**	Derive the expression for ratio of driving tensions in a flat belt drive.	**07**
	(b)	A steel drum weighing 20 kg contains 25 kg of water at 20˚C. $0.7m^3$ of steam at a pressure of 8 bar is passed into the drum. The temperature of water after mixing with the steam is 82˚C. find the quality of steam passed into the steel drum. Assume C_p for material of drum as 0.84 kJ/kg K.	**07**

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