Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–I & II (NEW) EXAMINATION – WINTER 2020

Subject Code:3110006 Date:18/03/2021

Subject Name:Basic Mechanical Engineering

Time:10:30 AM TO 12:30 PM Total Marks:56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of steam tables is permitted in exam**

			Marks
Q.1	**(a)**	List advantages of Solar energy and its application.	**03**
	(b)	Explain phenomena of global warming and causes of ozone depletion.	**04**
	(c)	Define the following terms: Prime movers, Internal energy, heat capacity, first law of thermodynamics, state, Path, Zeroth law of thermodynamics.	**07**
Q.2	**(a)**	Classify pumps on basis of principle, construction, and fluid flow direction in pump.	**03**
	(b)	Explain the following terms: volumetric efficiency, compression ratio.	**04**
	(c)	With usual notations derive expression to determine efficiency of Otto Cycle.	**07**
Q.3	**(a)**	Define the following terms: Boyles law, Avogadro's law, Charles Law.	**03**
	(b)	A Vessel of 2.5 m^3 capacity contains one kg –mole of nitrogen at 100°C. Calculate the specific volume and pressure if the gas is cooled to 30°C, calculate final pressure, change in specific internal energy and specific enthalpy.	**04**
	(c)	Explain adiabatic process. Derive an expression for work done during the adiabatic expansion of an ideal gas.	**07**
Q.4	**(a)**	What is superheated steam, list its advantages and application.	**03**
	(b)	With neat sketch explain construction and working of separating calorimeter.	**04**
	(c)	Calculate the internal energy of 1 kg of superheated steam at a pressure of 10 bar and 280°C. If this steam is to be expanded to a pressure of 1.6 bar and 0.8 kg dry, determine the change in internal energy. Assume specific heat of superheated steam as 2.1k J /kg K.	**07**
Q.5	**(a)**	In an Otto cycle the temperature at the beginning and end of the isentropic compression are 316 K and 596 K resply. Determine the air standard efficiency and compression ratio. Assume γ=1.4	**03**
	(b)	With neat sketch explain construction and working of water level indicator.	**04**
	(c)	Draw neat sketch of an internal combustion engine, list its parts and state functions of each.	**07**
Q.6	**(a)**	Compare reciprocating compressor and rotary compressor.	**03**
	(b)	List essential qualities of a good boiler.	**04**

	(c)	During a trial on single cylinder oil engine, working on the four stroke cycle and fitted with rope brake the following readings were taken, Effective diameter of brake wheel= 630mm, dead load on the brake=200N, spring balance reading=30N, Speed =450rpm, Area of indicator diagram=420mm^2, length of indicator diagram=60mm, spring scale=1.1 bar per mm, diameter of cylinder=100mm, stroke=150mm, quantity of oil used =0.815kg/hr, calorific fuel of oil =42,000k J /kg, Calculate brake power, indicated power, mechanical efficiency, brake thermal efficiency, and brake specific fuel consumption.	**07**
Q.7	**(a)**	Draw neat sketch of domestic refrigerator and list its different parts.	**03**
	(b)	Compare belt drive, chain drive and gear drive.	**04**
	(c)	List and explain physical, thermal, mechanical and electrical properties of metals.	**07**
Q.8	**(a)**	Explain working of split air conditioner.	**03**
	(b)	List properties of copper and its applications.	**04**
	(c)	Draw sketch and label the following: shoe brake, cone clutch, flange coupling	**07**

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