GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–1/2 EXAMINATION – WINTER 2021

Subject Code:3110006   **Date:30/03/2022**
Subject Name:Basic Mechanical Engineering
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.**

Q-1	**(a)**	Define zeroth law of thermodynamics, and First law of thermodynamics.	03
	(b)	With usual notations prove that $C_p - C_v = R$.	04
	(c)	Write a difference between SI engine and CI engine.	07
Q-2	**(a)**	Describe the process of formation steam on T-H diagram.	03
	(b)	Write a short note on "Global Warming and solar energy"	04
	(c)	Ford car having a four cylinder, four stroke petrol engine has 100 mm bore and stroke is 1.25 times the bore. It consumes 4 kg of fuel per hour having calorific value of 41,000 kJ/kg. The engine speed is 800 rpm. Calculate indicated thermal efficiency if mean effective pressure is 0.75 MPa.	07

OR

	(c)	A 4-cylinder, two-stroke cycle petrol engine develops 30 kW at 2500 rpm. The mean effective pressure on each piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder if stroke to bore ratio is 1.5. Also the fuel consumption of engine, if brake thermal efficiency is 28% and calorific value is 43900 kJ/kg.	07
Q-3	**(a)**	How do you classify steam boilers?	03
	(b)	Draw labeled diagram of Babcock and wilcox boiler.	04
	(c)	An air standard Otto cycle has compression ratio of 6. The temperature at the start of compression is 25ºC and pressure is 1 bar. If the maximum temperature of the cycle is 1150ºC. Calculate (a) the heat supplied and heat rejected per kg of air (b) network done per kg of air and (c) thermal efficiency of cycle. Assume γ=1.4, C_v= 0.778 kJ/kg K for air.	07

OR

Q-3	**(a)**	List out application of compressed air.	03
	(b)	Explain single acting reciprocating pump.	04
	(c)	One kg of a gas at 1 bar pressure and 17ºC is compressed isothermally to a pressure of 25 bar in a cylinder. The characteristic gas constant is 260 J/kg K. calculate (a) the final temperature (b) work done and (c) change in enthalpy.	07
Q-4	**(a)**	What is priming? Why priming is required in centrifugal pump but not in reciprocating pump.	03
	(b)	Define (i) Dryness fraction (ii) wetness fraction.	04
	(c)	Explain vapour compression refrigeration cycle used in domestic refrigerator.	07

OR

Q-4	**(a)**	Write function of clutch, Break and Coupling.	03
	(b)	Compare belt drive, chain drive and gear drive.	04

(c) Define following mechanical properties: (1) Elasticity (2) Malleability (3) Ductility (4) Stiffness (5) Hardness (6) Toughness (7) Resilience. **07**

Q-5 **(a)** Explain open system, closed system and isolated system. **03**

(b) Define (i) one ton of refrigeration (ii) COP. **04**

(c) Explain construction and working of centrifugal compressor with neat sketch. **07**

OR

Q-5 **(a)** Define ferrous and Nonferrous material with example. **03**

(b) Explain types of Belt Drives. **04**

(c) Write a short on a single plate (disc) friction clutch. **07**

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