GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–I & II EXAMINATION – WINTER 2024

Subject Code:BE01000081   **Date:08-01-2025**

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.**
5. **Use of Steam Tables is permitted.**

Q.1	**(a)**	Explain with neat sketch: Open, Close and Isolated system.	**03**
	(b)	Find expression of work done and change in internal energy for adiabatic process.	**04**
	(c)	Discuss the primary causes of global warming. What are impacts of global warming?	**07**
Q.2	**(a)**	Write the statements for Boyle's law, Charles's law and Gay-Lussac's law.	**03**
	(b)	What do you mean by non metallic materials? Name any three non metallic materials and state its practical importance.	**04**
	(c)	With a neat sketch explain Throttling calorimeter.	**07**

OR

	(c)	5 kg of air is heated from 25^0 C to 150^0 C. Determine: (i) specific heats, (ii) change in internal energy, (iii) change in enthalpy and (iv) heat supplied. Assume R = 0.287 kJ/kgK and γ = 1.4 for air and work done = 500 kJ.	**07**
Q.3	**(a)**	State the assumptions made in working of Carnot cycle. Also write down the limitations of Carnot cycle.	**03**
	(b)	An engine operation on an air-standard Otto cycle has a compression ratio equal to 7. The conditions at the start of compression are 0.1 MPa and 300 K. The pressure at the end of heat addition is 4 MPa. Determine: (i) thermal efficiency, (ii) net work done per kg of air. Take Cv = 0.718 kJ/kg , and γ = 1.4	**04**
	(c)	Derive equation for air standard efficiency of diesel cycle.	**07**

OR

Q.3	**(a)**	Give difference between SI and CI engines.	**03**
	(b)	The following data were noted for a 4-cylinder, 4-stroke engine: Diameter = 101 mm, stroke = 114 mm, engine speed = 1600 rpm, fuel consumption = 0.204 kg/min, heating value of fuel = 41,800 kJ/kg, difference in either side of the brake pulley = 378 N, brake pulley radius = 3.35 m. Assume mechanical efficiency = 83%. Calculate: (i) brake thermal efficiency, (ii) indicated thermal efficiency, (iii) fuel consumption per brake power.	**04**
	(c)	Explain with neat sketch four stoke diesel engine.	**07**

Q.4 **(a)** What is priming? Why is it required in centrifugal pump? **03**

(b) Explain with P-V diagram need of multi staging in reciprocating air compressor. **04**

(c) Explain with neat sketch working of Babcock and Wilcox boiler. **07**

OR

Q.4 **(a)** Define boiler. Also mention at least five essential requirements of a good boiler. **03**

(b) Give comparison between reciprocating and centrifugal pump. **04**

(c) What do you mean by mounting and accessories? Enlist different boiler mountings and accessories with their functions. **07**

Q.5 **(a)** Define the terms: Refrigeration, Refrigeration effect and Coefficient of Performance. **03**

(b) Write down comparison between Belt, Chain and Gear drive. **04**

(c) Explain with neat sketch vapour compression refrigeration system. **07**

OR

Q.5 **(a)** Define air conditioning. Also give the classification of air conditioning system. **03**

(b) Explain with a neat sketch working of internal expanding shoe brake. **04**

(c) What do you mean by the word 'Friction clutches'? Explain with neat sketch working of a centrifugal clutch. **07**

****