

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-I&II EXAMINATION – SUMMER 2025****Subject Code:BE01000081****Date:09-06-2025****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.

		Marks
<b>Q.1</b>	(a) Discuss Closed, Open and Isolated Thermodynamic system with neat sketch.	<b>03</b>
	(b) Explain different between renewable and non-renewable energy.	<b>04</b>
	(c) Derive the characteristics gas equation for a perfect gas with usual notations.	<b>07</b>
<b>Q.2</b>	(a) State and explain zeroth law of thermodynamics and First law of thermodynamics.	<b>03</b>
	(b) With usual notations prove that $C_p - C_v = R$ .	<b>04</b>
	(c) Write a difference between SI engine and CI engine.	<b>07</b>
	<b>OR</b>	
	(c) A sample of wet steam at pressure of 15 bar has a dryness fraction of 0.06. determine the enthalpy, volume, entropy and internal enthalpy per kg.	<b>07</b>
<b>Q.3</b>	(a) What is dryness fraction? Also state its importance.	<b>03</b>
	(b) List essential qualities of a good boiler.	<b>04</b>
	(c) One kg of air at 7 bar pressure and 90 <sup>0</sup> C temperature undergoes a non-flow process. The law of expansion is $PV^{1.1} = C$ . the pressure falls to 1.4 bar during process calculate (1) the final temperature (2) work done (3) Change in internal energy (4) Heat exchange. Take $R = 287 \text{ J/kg.K}$ and $\gamma = 1.4$ for air.	<b>07</b>
	<b>OR</b>	
<b>Q.3</b>	(a) What is priming? Why priming is required in centrifugal pump?	<b>03</b>
	(b) List different mountings of boiler and explain any one in brief.	<b>04</b>
	(c) With usual notation derive the expression for air standard efficiency of diesel cycle.	<b>07</b>
<b>Q.4</b>	(a) What is the difference between rigid coupling and flexible coupling?	<b>03</b>
	(b) Explain working of Vapor absorption refrigeration system with neat sketch.	<b>04</b>
	(c) One kg of an ideal gas is heated from 18 <sup>0</sup> C to 98 <sup>0</sup> C assuming $R = 0.27 \text{ KJ/kgK}$ and $\gamma = 1.18$ for gas calculate (1) specific heats ( $C_p$ and $C_v$ ) (2) Change in internal energy (3) change in enthalpy.	<b>07</b>
	<b>OR</b>	
<b>Q.4</b>	(a) Write the function of following I.C. Engine components: (1) Spark Plug (2) Injector (3) Piston Rings	<b>03</b>
	(b) Define the terms: Hardness, Toughness, Ductility, Elasticity	<b>04</b>
	(c) It is required to find out the efficiency of an air standard Carnot Cycle with the following data. Minimum temperature of cycle 15 <sup>0</sup> C, minimum pressure in cycle 1 bar. Pressure after isothermal compression 3.5 bar. Pressure after isentropic compression 10.5 bar. Assume $R = 0.287 \text{ KJ/kgK}$ for air. What power would be produced if engine makes 2 cycles/second.	<b>07</b>

- Q.5** (a) What is throttling calorimeter? Also state its limitation **03**  
(b) Explain working of split air conditioner. **04**  
(c) Calculate the dimensions (diameter and stroke) of a double acting reciprocating compressor neglecting clearance volume from the following additional data: compressor power=10 kw, Compressor ratio=7, Inlet pressure=1 bar, Piston speed = 180 m/min, Law of compression =  $PV^{1.3}=C$ ,  $L/D = 1.5$  **07**

**OR**

- Q.5** (a) Define brake and also state difference between clutch and coupling. **03**  
(b) Elaborate differences between reciprocating and rotary compressor? **04**  
(c) A six-cylinder four stroke petrol engine develop 300 KW brake power at 2500 rpm. The stroke to bore ratio is 1.25. Assuming the mechanical efficiency as 80% and mean effective pressure of 9 bar, determine the bore and stroke of engine. Also find the fuel consumption in kg/hr if indicated thermal efficiency is 30% and CV of fuel used is 41900 KJ/kg. **07**

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