

Enrolment No./Seat No\_\_\_\_\_

## GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-I & II (NEW) EXAMINATION – SUMMER 2024

Subject Code:3110006

Date:08-07-2024

Subject Name:Basic Mechanical Engineering

Time:02:30 PM TO 05:00 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) Define these terms: (1) Absolute Pressure (2) Thermal Equilibrium (3) Prime Mover	<b>03</b>
(b) Explain with suitable examples the following thermodynamic systems: (1) Isolated (2) Open	<b>04</b>
(c) Write a short note on “Renewable Energy Sources”.	<b>07</b>
<b>Q.2</b> (a) Define: (1) Isothermal process (2) Adiabatic process (3) Degree of superheat.	<b>03</b>
(b) Determine the condition of steam at a pressure of 10 bar and temperature of 200 °C.	<b>04</b>
(c) A gas initially at 510 kPa and volume of 142 liters undergoes a certain process after which the pressure and volume reach to 170 kPa and 275 liters respectively. And there is enthalpy drop of 65 kJ. The specific heat at constant volume for this gas is 718 J/kg-K. Calculate:1. Change in internal energy 2. Specific heat at constant pressure 3. Gas Constant.	<b>07</b>
<b>OR</b>	
(c) (1) Draw neat diagram of the Separating Calorimeter. (2) Determine the dryness fraction of steam after throttling from pressure 14 bar to 1.1 bar. The initial dryness fraction of steam is equal to 0.70	<b>07</b>
<b>Q.3</b> (a) Define the terms: (1) T.D.C. (2) B.D.C. (3) Compression Ratio	<b>03</b>
(b) Classify the I. C. Engines.	<b>04</b>
(c) Calculate the air standard efficiency of the diesel cycle where the pressure and temperature at the beginning of compression process are 1 bar and 27 °C respectively. The compression ratio is 14 and the constant pressure heat addition continues up to 7% of the stroke volume. Draw this Diesel cycle on p-v diagram.	<b>07</b>

**OR**

- Q.3** (a) Write the function of following I.C. Engine components: **03**  
(1) Spark Plug (2) Injector (3) Piston Rings
- (b) Calculate the air standard efficiency of an Otto Cycle engine having a bore of 100 mm and stroke length equal to 150 mm. The clearance volume of cylinder is equal to  $250 \text{ cm}^3$ . Take  $\gamma = 1.4$ . **04**
- (c) A Diesel engine develops 5 kW brake power at a speed of 1000 rpm. **07**  
The mechanical efficiency of the engine is 75% and indicated thermal efficiency is equal to 30 %. The diesel fuel having specific gravity = 0.87 and calorific value = 42700 kJ/kg is used.  
Calculate: 1. Fuel consumption in kg/h. 2. Brake thermal efficiency 3. Brake specific fuel consumption.
- Q.4** (a) Define these terms: (1) Refrigerant (2) C.O.P. (3) Air conditioning. **03**  
(b) Classify the Boilers. **04**  
(c) Explain with neat diagrams the working of centrifugal compressor and centrifugal pump. **07**

**OR**

- Q.4** (a) What is an economizer? Why is it used in boiler plant? **03**  
(b) Classify the Pumps. **04**  
(c) Explain the characteristics of a Lancashire boiler with neat diagrams. **07**
- Q.5** (a) List the important properties of engineering materials. **03**  
(b) Explain with neat diagram the working of domestic refrigerator. **04**  
(c) Classify: (1) Clutches (2) Brakes **07**

**OR**

- Q.5** (a) Define these terms: (1) Coupling (2) Shaft (3) Spindle **03**  
(b) Explain with neat diagram the construction and working of Roots Blower. **04**  
(c) Compare: Belt, Chain and Gear drives. **07**

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