

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-I & II(NEW)EXAMINATION – SUMMER 2022****Subject Code:3110006****Date:03-08-2022****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.

	<b>MARKS</b>
<b>Q.1</b> (a) Define (1) Critical Point (2) Enthalpy (3) Extensive property.	<b>03</b>
(b) Give advantages of liquid fuels compared to solid fuels.	<b>04</b>
(c) Derive the characteristics gas equation for a perfect gas with usual notations.	<b>07</b>
<b>Q.2</b> (a) Give comparison between work and heat.	<b>03</b>
(b) Define (1) sensible heat (2) Latent heat (3) Degree of superheat (4) Specific volume of steam.	<b>04</b>
(c) A 4 cylinder, 4 stroke marine oil engine has a cylinder diameter of 490 mm and a piston stroke of 1000 mm. the engine uses 130 kg of fuel of calorific value 42000 KJ/kg in one hour when running at 2 rev/sec. the torque transmitted at the engine coupling is 22 KN.m and indicated mean effective pressure 710 KN/m <sup>2</sup> . Determine (1) Indicated power (2) Brake power (3) Brake thermal efficiency (4) Mechanical efficiency (5) Indicated thermal efficiency.	<b>07</b>
<b>OR</b>	
(c) A two-cylinder four stroke petrol engine has swept volume of 1.1 x 10 <sup>-3</sup> m <sup>3</sup> . It run at 950 rpm and consume 2.2 kg of petrol per hour having calorific value of 43000 KJ/kg. The mean effective pressure in both cylinder is 7.5 bar. Determine indicated thermal efficiency if clearance volume is 15% of swept volume.	<b>07</b>
<b>Q.3</b> (a) Explain physical properties of engineering materials.	<b>03</b>
(b) Efficiency of Carnot cycle is independent of working fluid justify.	<b>04</b>
(c) The initial volume of 0.9 kg of a certain gas was 0.75 m <sup>3</sup> at a temperature of 15 <sup>0</sup> C and a pressure of 1 bar. After adiabatic compression the volume is reduce to 0.28 m <sup>3</sup> and pressure was found to be 4 bar. Calculate (1) gas constant (2) molecular mass if R <sub>0</sub> = 8314.3 J/kg mol K, (3) ratio of specific heats (4) Cp and Cv (5) change in internal energy	<b>07</b>
<b>OR</b>	
<b>Q.3</b> (a) What is thermal prime mover? Why they are most important prime movers?	<b>03</b>
(b) What are nonferrous metals? Name any five and state their application.	<b>04</b>
(c) Explain with neat sketch throttling calorimeter. Also state its advantages and disadvantages.	<b>07</b>
<b>Q.4</b> (a) What is clutch? State its functions.	<b>03</b>
(b) What is refrigerant? Describe the properties of good refrigerant.	<b>04</b>

- (c) A cylindrical vessel of 1 m diameter and 4 m length has hydrogen gas at pressure of 100 KPa and 27<sup>0</sup> C. Determine the amount of heat to be supplied so as to increase gas pressure to 125 KPa. For hydrogen take  $C_p = 14.307 \text{ KJ/Kg K}$ ,  $C_v = 10.183 \text{ KJ/Kg K}$ . **07**

**OR**

- Q.4** (a) What is the difference between rigid coupling and flexible coupling? **03**  
(b) What is priming? Why priming is required in centrifugal pump but not in reciprocating pump? **04**  
(c) Air is to be compressed in a single acting reciprocating compressor from 1.013 bar and 150 C to 7 bar. Calculate the indicated power required for free air delivery of 0.3 m<sup>3</sup>/min. when the compression process is 1. Isentropic 2. Reversible isothermal 3. polytropic with  $n = 1.25$ . **07**

- Q.5** (a) Explain 1 ton of refrigeration and refrigeration effect. **03**  
(b) What are the advantages and disadvantages of water tube boiler over fire tube boiler? **04**  
(c) Explain construction and working of Babcock and Wilcox boiler with line diagram **07**

**OR**

- Q.5** (a) Economizer used to increase efficiency of boiler justify this statement. **03**  
(b) What are the differences between reciprocating and rotary compressor? **04**  
(c) Determine the efficiency of air standard Carnot cycle with the following **07**  
data

Minimum temperature of the cycle = 27<sup>0</sup> C

Minimum pressure in the cycle = 1 bar

Pressure after isothermal compression = 4.5 bar

Pressure after isentropic compression = 12 bar

Take  $R = 0.287 \text{ KJ/kg K}$ .

Determine also power produced if engine makes 3 cycle/sec.

\*\*\*\*\*

GTUQuestionPapers.com

made with  
elity