Seat No.: _____ Enrolment No._____

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.**

			MARKS
Q.1	**(a)**	Define (1) Critical Point (2) Enthalpy (3) Extensive property.	**03**
	(b)	Give advantages of liquid fuels compared to solid fuels.	**04**
	(c)	Derive the characteristics gar equation for a perfect gas with usual notations.	**07**
Q.2	**(a)**	Give comparison between work and heat.	**03**
	(b)	Define (1) sensible heat (2) Latent heat (3) Degree of superheat (4) Specific volume of steam.	**04**
	(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^2. Determine (1) Indicated power (2) Brake power (3) Brake thermal efficiency (4) Mechanical efficiency (5) Indicated thermal efficiency.	**07**
		OR	
	(c)	A two-cylinder four stroke petrol engine has swept volume of 1.1 x 10^{-3} m^3. 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.	**07**
Q.3	**(a)**	Explain physical properties of engineering materials.	**03**
	(b)	Efficiency of Carnot cycle is independent of working fluid justify.	**04**
	(c)	The initial volume of 0.9 kg of a certain gas was 0.75 m^3 at a temperature of 15^0 C and a pressure of 1 bar. After adiabatic compression the volume is reduce to 0.28 m^3 and pressure was found to be 4 bar. Calculate (1) gas constant (2) molecular mass if R_0 = 8314.3 J/kg mol K, (3) ratio of specific heats (4) Cp and Cv (5) change in internal energy	**07**
		OR	
Q.3	**(a)**	What is thermal prime mover? Why they are most important prime movers?	**03**
	(b)	What are nonferrous metals? Name any five and state their application.	**04**
	(c)	Explain with neat sketch throttling calorimeter. Also state its advantages and disadvantages.	**07**
Q.4	**(a)**	What is clutch? State its functions.	**03**
	(b)	What is refrigerant? Describe the properties of good refrigerant.	**04**

	(c)	A cylindrical vessel of 1 m diameter and 4 m length has hydrogen gas at pressure of 100 KPa and 27^0 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 KJ/Kg K, C_v =10.183 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^3/min. when the compression process is 1. Isentropic 2. Reversible isothermal 3. polytopic 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 data Minimum temperature of the cycle =27^0 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 KJ/kg K. Determine also power produced if engine makes 3 cycle/sec.	**07**

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