

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- I & II (NEW) EXAMINATION – WINTER 2019

Subject Code: 3110006

Date: 03/01/2020

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. Use of steam tables is allowable

		Marks
Q.1	(a) Define prime movers. Write any Four examples of the prime movers.	03
	(b) Define the terms: Hardness, Toughness, Ductility, Elasticity	04
	(c) List the non-convectional sources of energy. Prepare a short note on solar energy.	07
Q.2	(a) Distinguish between coupling and clutch.	03
	(b) Describe briefly using neat diagrams the types of belt drives.	04
	(c) Explain with neat sketch the Vapor Compression Refrigeration system. Also draw p-h and T-s diagram for the same.	07
	OR	
	(c) Classify Air Compressors. Explain construction and working of centrifugal pump with sketch.	07
Q.3	(a) Prove that the difference between two specific heats of gases is equal to its characteristic gas constant.	03
	(b) Differentiate between gas constant and Universal gas constant.	04
	(c) One kg of gas at a pressure of 100 kPa and temperature of 17 °C is compressed isothermally in a piston-cylinder arrangement to final pressure of 2500 kPa. The characteristic gas equation is given by the relation $pV = 260 T$ per kg where T is in Kelvin. Find out (1) Final Volume (2) Compression Ratio (3) Change in enthalpy (4) Work done on the gas.	07
	OR	
Q.3	(a) One kg gas is compressed adiabatically by following the law $pV^\gamma = C$ from initial temperature of 290K. The initial pressure of gas is 1 bar. The initial and final volumes of gas are 0.50 m ³ and 0.05 m ³ respectively. Find the final temperature and pressure of gas. Assume $\gamma=1.4$	03
	(b) Write the uses of “Steam Tables”	04
	(c) Find the internal energy of 1 kg of steam at a pressure of 15 bar when steam is (1) Super-heated at a temperature of 400 °C and (2) Wet with dryness fraction of 0.9. Take specific heat of superheated steam as 2.1 kJ/kg-K.	07
Q.4	(a) A diesel engine works on Diesel cycle with a compression ratio of 15 and cut off ratio of 1.75. Calculate the air standard efficiency. Assume $\gamma= 1.4$.	03
	(b) Derive the equation for air standard efficiency of Otto cycle.	04
	(c) The following readings were observed during a test on Two Stroke Single Cylinder Diesel engine:	07
	Bore = 22 cm	
	Stroke = 28 cm	
	Speed = 350 rpm	

Net brake load = 65 kg
Effective brake drum diameter = 100 cm
Mean Effective Pressure = 3 bar
Fuel consumption = 4 kg/h
Calorific value of fuel = 43 MJ

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Calculate: (1) Indicated Power (2) Brake Power (3) Mechanical Efficiency (4) Brake thermal Efficiency

OR

- Q.4** (a) Classify I.C. Engines. **03**
(b) Determine the brake thermal efficiency of an engine with following data: **04**
Brake Power = 80 kW
Fuel consumption rate = 20 kg/hour
Calorific value of the fuel = 43 MJ/kg
(c) Discuss the construction and working of four stroke Petrol engines. **07**

- Q.5** (a) Define the terms 'Refrigeration', "Ton of Refrigeration" and "Coefficient of Performance" **03**
(b) What is boiler? Compare fire tube boiler with water tube boiler. **04**
(c) Explain with neat sketch, the construction and working of **07**
(1) Fusible plug (2) Air preheater.

OR

- Q.5** (a) Differentiate between reciprocating compressor and rotary compressor. **03**
(b) Differentiate between boiler mountings and accessories. **04**
(c) Discuss the construction details and working of Cochran boiler with neat sketch. **07**

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