Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER 1st / 2nd EXAMINATION (OLD SYLLABUS) – SUMMER - 2017

Subject Code: 110006 **Date: 31/05/2017**

Subject Name: Elements of Mechanical Engineering

Time: 2:30 PM to 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of Steam table is permitted.**

Q.1	**(a)**	State Zeroth law, First law and Second law of thermodynamics.	**03**
	(b)	With usual notations prove that $C_p - C_v = R$.	**04**
	(c)	Explain the construction and working of Babcock and Wilcox boiler with neat sketch.	**07**
Q.2	**(a)**	Briefly classify the fuels. Define H.C.V and L.C.V.	**03**
	(b)	Compare the following : 1) S.I. engine with C.I. engine. 2) 2-stroke with 4-stroke I.C. engine	**04**
	(c)	A cylinder contains 0.5 m^3 of a gas at a pressure of 1 bar and 90^0C. The gas is compressed to a volume of 0.15m^3. The final pressure is 5 bar. Calculate: (i) the mass of gas (ii) value of index 'n' for compression (iii) the increase in internal energy. Take $\gamma = 1.4$ and R = 294.2 J/kgK.	**07**
Q.3	**(a)**	Differentiate clearly between governor and flywheel.	**03**
	(b)	Derive the equation of thermal efficiency of Carnot Cycle. Why it cannot be used in practice? Discuss.	**04**
	(c)	3 kg of steam at pressure of 10bar exists in the following conditions. Calculate its enthalpy in each of the following cases: (i) steam with dryness fraction = 0.91 (ii) steam at temperature 200^0C (iii) Dry and Saturated steam.	**07**
Q.4	**(a)**	Write down the working of Fusible plug, Blow-off cock and Pressure gauge.	**03**
	(b)	Explain the working of Separating and throttling Calorimeter.	**04**
	(c)	A two cylinder four stroke petrol engine has swept volume of 1.1 x 10^{-3} m^3. It runs at 950 rpm and consumes 2.2 kg of petrol per hour having C.V. of 43000 kJ/kg. The mean effective pressure in both cylinders is 7.5 bars. Determine indicated thermal efficiency and relative efficiency if clearance volume is 15% of swept volume.	**07**
Q.5	**(a)**	Explain Double Acting Reciprocating pump.	**03**
	(b)	Explain the working of vapour compression refrigeration system.	**04**
	(c)	With usual notations derive an expression for work done for single stage single acting reciprocating air compressor by considering clearance volume.	**07**
Q.6	**(a)**	Define: (i) Refrigerating effect (ii) Priming (iii) COP	**03**
	(b)	Define steam boiler. Compare Fire tube boiler with Water tube boiler.	**04**

	(c)	A petrol engine has swept volume of 500 cm^3 and clearance volume of 55 cm^3. At suction, pressure and temperature is 1 bar and 30^0C respectively and maximum temperature in the cycle is 1450^0C. Calculate air standard efficiency and mean effective pressure of the cycle. Take $\gamma = 1.41$, R = 0.287 kJ/kgK	**07**
Q.7	**(a)**	Define: (i) Creep (ii) Toughness (iii) Fatigue	**03**
	(b)	Explain Internal expanding shoe brake with neat sketch.	**04**
	(c)	ClassifyMechanical drives. Explain in brief: (i) Cross belt drive (ii) Helical gear	**07**

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