Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–I • EXAMINATION – WINTER 2014

Subject Code: 110006 Date: 26-12-14

Subject Name: ELEMENTS OF MECHANICAL ENGINEERING

Time:10.30a.m.-01.00p.m. Total Marks: 70

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q. 1 **(a)** Five kg of air is heated from initial volume of 0.5 m^3 to final volume of 1.3 m^3 at constant pressure 4 bar. Determine (1) heat supplied (2) work done (3) initial and final temperature of air. Take C_p=1.005 KJ/kg-K and R=0.287 KJ/kg-K **07**

(b) Explain with a neat sketch Lancashire boiler. **07**

Q. 2 **(a)** What is the function of pump? Classify the pumps. Explain with sketch the working of single acting piston pump. **07**

(b) A four cylinder Diesel engine of truck has bore 0.1 m and stroke 0.13 m. Piston speed =10.5 m/s, engine power =20 KW, Brake thermal efficiency =35%, Calorific value =42 MJ/kg, specific gravity=0.84. Determine(1) engine speed in rpm(2)brake power and fuel consumption in litres per hour **07**

Q. 3 **(a)** Prove the equation for air standard efficiency of otto cycle. **07**

(b) Discuss Watt Governor and Porter Governor in detail **07**

Q. 4 **(a)** Discuss various types of power transmission devices **07**

(b) Define following mechanical properties **07**
(1)Elasticity(2)Malleability(3)Ductility(4)Impactstrength(5)Hardness(6)Toughness(7)Resiliance

Q. 5 **(a)** Following data were recorded during the test of steam by combined throttling and separating calorimeter: **07**

Water separated in separating calorimeter	0.4 kg
Steam discharge from throttling calorimeter	6 kg
Steam pressure in the main pipe	10 bar
Manometer reading	170 mm of Hg
Barometer reading	760 mm of Hg
Temperature of steam after throttling	130^0C

Determine dryness fraction of steam. Take C_{ps}=2.1 KJ/kg-K

Q. 5 **(b)** Derive characteristics equation of a perfect gas. **07**

07

Q. 6 **(a)** Explain the following terms in brief: **07**
(1)Heat and work
(2)Specific heat and calorific value of fuel
(3)Differentiate between vapor and gas
(4)List various source of energy

Q. 6 **(b)** List various types of bearings and discuss any three of them. **07**

Q. 7 **(a)** What is an axial flow compressor? How it differs from centrifugal compressor? **07**

Q. 7 **(b)** With the help of neat sketch the working of four stroke diesel engine. **07**

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