

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 $C_p=1.005 \text{ KJ/kg-K}$ and $R=0.287 \text{ KJ/kg-K}$ **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)Resilience
- 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°C |
- Determine dryness fraction of steam. Take $C_{ps}=2.1 \text{ KJ/kg-K}$
- Q. 5** (b) Derive characteristics equation of a perfect gas. **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**
