Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– 1st / 2nd EXAMINATION (New Syllabus) – WINTER 2014

Subject Code: 2110006 Date: 26-12-2014

Subject Name: Elements of Mechanical Engineering

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

Instructions:

1. **Question No. 1 is compulsory. Attempt any Four out of remaining Six questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of Steam Tables is permitted**

Q.1 **MARKS**

(a) **Answer the given MCQ.** **07**

1. The unit of work is
(a) N.m (b) Joule (c) $kg.m^2/s^2$ (d) all the above

2. The function of ozone layer is
(a) protects the earth from harmful effect of ultraviolet rays
(b) increase the temperature of earth
(c) increases CO_2 in atmosphere
(d) none of the above

3. In the Polytropic Process $PV^n = C$, if $n = \infty$, the process is called
(a) isochoric (b) isobaric (c) isothermal (d) adiabatic

4. Saturation temperature of steam increase
(a) With decrease in pressure (b) with increase in pressure
(c) is unaffected by pressure (d) none of the above

5. During adiabatic process
(a) heat transfer is zero (b) work transfer is zero (c) enthalpy remains constant
(d) enthalpy change is zero.

6. The processes of Carnot cycle are
(a)Two adiabatic and two constant volume
(b)Two constant pressure and two constant volume
(c)Two isothermal and two adiabatic
(d)Two isothermal and two isentropic

7. The air standard cycle on which the petrol engine work is
(a) Otto cycle (b) Carnot cycle (c) Joule cycle (d) Dual cycle

OR

(a) **Answer the given MCQ.** **07**

1. Pump is a machine which is used to do
A) lift liquid from low height to higher elevation B) To store liquid
C) To compress liquid D) none of the above

2. which of the following energy is converted into electricity in a Hydo power plant
A) Nuclear energy B) Potential Energy of water
C) Thermal Energy D) all of the above

3. which of the following is a unit of Electric current
A) Ampere B) Volt
C) Meter D) kilogram

4. Which of the following instrument is used to measure length
A) Vernier calliper B) Manometer
C) Thermometer D) none of the above

5. In a simple gear train having two gears , if driving gear rotates in clockwise direction then driven gear rotates in
A) Clockwise direction B) Anti clockwise direction
C) depend on size of gear D) depend on no. of teeth

6. In a IC engine which energy is converted into mechanical energy
A) Chemical energy of fuel. B) potential energy
C) kinetic energy D) All of the above

7. which of the following instrument is used for drawing a straight lines
A) T- Square B) French curves
C) Protractor D) Compass

(b) Answer the given MCQ. **07**

1. Which of the following are boiler mountings?
(a) Economiser (b) Fusible Plug (c) Super heater (d) Air preheater

2. The function of steam stop valve is
(a) to regulate flow of steam from boiler to steam pipe
(b) to separate steam from water
(c) to collect steam from steam drum
(d) to provide safety of boiler

3. Petrol engine is
(a) Compression ignition engine (b) Spark ignition engine (c) mixed ignition engine (d) all of the above

4. Which of the following is a positive belt drive.
(a) V-belt (b) flat belt (c) Cross belt (d) timing belt

5. A operation of filling passage ways with liquid from outside source before starting pumps is known as
(a) cavitation (b) cleaning (c) priming (d) chocking

6. _____is the ability of a material to resist deformation under stress.
(a) strength (b) stiffness (c) hardness (d) brittleness

7. A one ton refrigeration system means that its refrigerating system is
(a) 50 KJ/min (b) 210 KJ/min (c) 300 KJ/min (d) 350 KJ/min

Q.2 **(a)** Write a short note on solar energy? **03**

(b) Explain Barrel calorimeter with neat sketch. **04**

(c) One kg of gas is compressed polytropically from 160 kpa pressure and 280 K temperature to 760 KPa. The compression is according to law $PV^{1.3}$= Constant. Find: (1) Final Temperature (2) work done (3) change in internal energy (4) amount of heat transfer and (5) change in enthalpy. Take R=0.287 KJ/KgK and C_p= 1.002 KJ/KgK. **07**

Q.3 **(a)** Show the function and location of the following in the boiler plant: **03**
(i) Economiser (ii) Steam stop valve (iii) Fusible plug.

(b) Derive C_p-C_v=R, with usual notations. **04**

(c) 1.5 kg of steam at a pressure of 10 bar and temperature of 250^0C is expanded until the pressure becomes 2.8 bar. The dryness fraction of steam is then 0.9. Calculate change in internal energy. **07**

Q.4 **(a)** Compare Rankine cycle with Carnot cycle. **03**

(b) In an Otto cycle the compression ratio is 10. The temperature at the beginning of compression and at the end of heat supply is 300 K and 1600 K respectively. Assume, γ = 1.4 and C_v= 0.717 KJ/KgK. **04**
Find: (i) Heat supplied (ii) Efficiency of the cycle.

(c) Sketch and explain a Cochran boiler. **07**

Q.5 **(a)** Explain with the help of neat sketches, the working of two stroke petrol engine. **07**

(b) Derive an equation for air standard efficiency of Otto cycle. **07**

Q.6 **(a)** Explain working of a centrifugal pump. **03**

(b) What is compressor? Give uses of compressed air. **04**

(c) Explain Vapor Compression Refrigeration system with neat sketch. Also draw p-h and T-s diagram for the same. **07**

Q.7 **(a)** Define the following mechanical properties **03**
(i) Ductility (ii) Hardness (iii) Plasticity

(b) What is belt drive? Describe briefly types of belt drives. **04**

(c) What is coupling? Explain internal expanding shoe brake with a neat sketch? **07**

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