Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–I & II EXAMINATION – WINTER 2015**

**Subject Code: 110006** **Date:23/12/2015**

**Subject Name: Elements of Mechanical Engineering**

**Time: 10:30am to 01:00pm** **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)** Choose correct answer of following Objective Questions. **07**

1. _____ is not types of mechanical energy.
(a) Potential Energy (b) Heat Energy (c) Kinetic Energy (d) None of above

2. Any change that a system undergoes from one equilibrium state to another is known as_____.
(a) Path (b) Process (c) Cycle (d) All of the above

3. The unit of rate of work is _____
(a) Nm/s (b) Joule/s (c) $kgm^2/s^3$ (d) All of above

4. _____boiler is not a fire tube boiler.
(a) Cochran (b) Lancashire (c) Babcock & Wilcox (d) Locomotive

5. Air preheater receives heat from _____
(a) from steam (b) from separate furnace (c) from flue gas (d) from feed water

6. A two stroke engine has_____
(a) inlet and exhaust port (b) inlet exhaust and transfer ports (c) inlet and exhaust valves only (d) all of above

7. Bronze is fundamentally alloy of _____
(a) Copper and zinc (b) Copper and nickel (c) Copper and tin (d) Copper, zinc and molyblednum

**(b)** Give the answer of any seven following question briefly. **07**

1. Define dryness fraction and wetness fraction
2. Define enthalpy with mathematical expression.
3. List sources of non-renewable energy.
4. What is function of carburetor in petrol engine?
5. Explain function of (i) Fusible plug (ii) Safety valve
6. Give fundamental difference between clutches and brakes.
7. What is jockey pulley in belt drive? What is its purpose?
8. Define (i) Malleability (ii) toughness
9. Define the term Free Air Delivered (FAD).

**Q.2** **(a)** In air compressor air enters at 1.013 bar and $27^oC$ having volume $5m^3/kg$ and it is compressed to 12 bar isothermally. Determine work done, heat transfer and change in internal energy. **05**

**(b)** Explain briefly the calorimeter which gives approximate value of dryness fraction. **05**

**(c)** A vessel of volume $4m^3$ contains wet steam of quality 0.75 dry at 19 bar. Determine masses of liquid and vapor present in the vessel. **04**

| Absolute pressure bar | Sat Temp $^0C$ | Specific Enthalpy KJ/Kg | | Specific Volume $m^3/Kg$ | |
|---|---|---|---|---|---|
| | | hf | hg | vf | vg |
| 19 | 209.6 | 896.8 | 2796.1 | 0.001172 | 0.105 |

**Q.3** **(a)** Explain briefly function, location and working of following. **05**
(i) Water level indicator (ii) Steam trap

**(b)** Sketch the Cochran boiler and label all important mountings and accessories. **05**

**(c)** An air standard otto cycle has compression ratio 7. The conditions at the start of compression are 0.1 MPa and 300 K. The pressure at the end of heat addition is 4 MPa. Determine thermal efficiency and net work done per kg of air, where $C_v$ = 0.718 KJ/Kg, $\gamma$ =1.4 for air. **04**

**Q.4** **(a)** What do you mean by positive displacement pump? Explain briefly any two rotary pumps with its application. **05**

**(b)** Why multiage compression has more benefit over single stage compression for achieving high pressure ratio? Explain with P-V diagram. **05**

**(c)** Give the function of following IC engine parts in one sentence. **04**
(i) Piston rings (ii) Connecting rod (iii) Spark plug (iv) Exhaust valve

**Q.5** **(a)** Draw working fluid flow diagram of the Vapour Compression Refrigeration System and describe the function of each important component of the system. **05**

**(b)** Define Air conditioning. List the important components of Air conditioning system. Also classify the system briefly. **05**

**(c)** Give comparison between Vapor compression and vapour absorption system. **04**

**Q.6** **(a)** Explain with neat sketch the working of single plate friction clutch. **05**

**(b)** Sketch single block brake, double block brake and band brake. Give their practical application. **05**

**(c)** Compare individual drive with group drive. **04**

**Q.7** **(a)** Define the following terms related to belt drive: **05**
(i) Velocity ratio (ii) Initial Tension (iii) Slip (iv) Creep (v) Power transmitted in belt drive.

**(b)** Discuss briefly alloy steels and give its practical application. **05**

**(c)** Discuss briefly any two non-metallic materials **04**

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