Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER– 1st / 2nd (NEW SYLLABUS) EXAMINATION – SUMMER 2015

Subject Code: 2110006 **Date: 04/06/2015**

Subject Name: Elements of Mechanical Engineering

Time: 10.30am-01.00pm **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.**

Q.1 **(a)** Multiple choice questions: **07**

1 Work is considered positive when
a) Work is done on the system b) work is done by the system c) both a and b d) none of the above

2 A source of energy is known as renewable source
a) Fossil fuel b) Nuclear c) CNG d) All of the above

3 When driving and driven shafts are at comparatively larger distance apart, the type of drive suitable is :
a) Gear drive b) Belt drive c) friction drive d) chain drive

4 The clutch ordinarily remains in disengaged condition when it is used for power transmission in:
a) Automobile b) Machine tools c) Crane d) Elevator

5 Which of the following type of centrifugal pump converts kinetic energy of pump into pressure energy:
a) Foot valve b) Casing c) Suction pipe d) Impeller

6 For earth moving machines, widely used engines are:
a) Petrol engine b) Steam engine c) Diesel engine d) Gas engine

7 The correct location of economizer is :
a) Between furnace and preheater b) between airpreheater and chimney
c) between forced draft fan and furnace d) near the superheater

OR

(a) Multiple choice questions: **07**

1 COMPRESSOR 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 OR gas. 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 Power.
A) Joules B) Watt
C) Meter D) kilogram

4 Which of the following instrument is used to measure temperature
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 from which of the following source 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 curved lines

A) T- Square B) French curves

C) Protractor D) Compass

(b) Select the correct option: **07**

1. Water after being pumped into a boiler cannot come out because of:
a) Steam stop valve b) Feed check valve c) Safety valve d) Blow off valve

2. For the same compression ratio, the thermal efficiency of otto cycle is :
a) Greater than Diesel engine b) less than Diesel engine c) equal to Diesel Engine d) None of the above

3. Diesel cycle consists of :
a) Two isentropic process and two isothermal process b) two isentropic, one constant pressure, one constant volume process c) two isothermal and two constant pressure process d) two isentropic, Two constant volume process

4. Dryness fraction of a steam (x) is given by:
a) m_s / m_w b) m_w / m_s c) $(m_s + 1) / m_w$ d) $m_s / (m_s + m_w)$

5. The material for making packing for covering steam pipes to avoid heat transfer, are made up of :
a) Asbestos b) Gold c) Iron d) Aluminum

6. The relation between C_p and C_v is:
a) $C_p - C_v = R$ b) $C_v - C_p$ c) $C_p + C_v = R$ d) $C_p . C_v$

7 Specific heat is defined as the amount required

a) To raise unit degree of temperature of a substance
b) To raise unit mass of a substance through unit degree of temperature
c) To raise unit mass of a substance through 10°C
d) None of the above.

Q.2 **(a)** Define the following terms: **03**

i) Higher calorific value ii) Mountings and accessories of boiler
iii) critical point and triple point of water.

(b) Differentiate: **04**

(i) Belt drive, chain drive and gear drive
(ii) Brake and Clutch

(c) Mention different parts of vapor compression refrigeration cycle along with their functions. Also draw a neat diagram of vapor compression refrigeration cycle. **07**

Q.3 **(a)** List methods of measuring dryness fraction. Explain any one of them. **07**

(b) Determine the work done in compressing one kg of air from a volume of $0.15 m^3$ at a pressure of 1 bar to a volume of $0.05 m^3$, when the compression is 1) adiabatic 2) isothermal. Take $\gamma = 1.4$. Give your comments. **07**

Q.4 **(a)** Explain water Temperature- Enthalpy Diagram for water. **07**

(b) What amount of heat is required to produce 5 kg of steam at a pressure of 5 bar and temperature of 250°C from water at 30°C, take $Cp_s = 2.1 kJ/kg K$ **07**

Q.5 **(a)** Discuss Rankine cycle in detail with flow diagram and P-V diagram. **07**

	(b)	An engine working on ideal Otto cycle has a clearance volume of $0.03m^3$ and swept volume of $0.12m^3$. The temperature and pressure at the beginning of compression are 100°C and 1 bar respectively. If the pressure at the end of heat addition is 25 bar, calculate i) ideal efficiency of the cycle. ii) Temperature at key points of the cycle. Take $\gamma = 1.4$ for air.	**07**
Q.6	**(a)**	Classify Air Compressors. Give the uses or application of compressed air.	**07**
	(b)	During testing of single cylinder two stroke petrol engine, following data is obtained: Brake torque 640 Nm, cylinder diameter 21 cm, Speed 350 rpm, stroke 28 cm, mean effective pressure 5.6 bar, oil consumption 8.16 kg/hr, C.V = 42705 kJ/kg. Find, i) Mechanical Efficiency, ii) Indicated thermal efficiency iii) brake thermal efficiency iv) brake specific fuel consumption.	**07**
Q.7	**(a)**	Explain flange coupling with neat sketch	**07**
	(b)	Classify properties of engineering material. Explain any three of them.	**07**

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