Seat No.: _____ **Enrollment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– 1st / 2nd EXAMINATION (NEW SYLLABUS) – SUMMER 2016

Subject Code: 2110006 **Date:01/06/2016**

Subject Name: Elements of Mechanical Engineering

Time:02:30 PM to 5:00 PM **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 table is allowable.**

Q.1 **Objective Question (MCQ)** **Mark**

(A) Select the correct answer **07**

1. The S.I. unit N-m/s is called
(a)Watt (b) Joule (c) Calorie (d) None of the above.

2. The Universal gas Constant is equal to
(a) M/R (b) R/M (c) M*R (d) All of the above

3. The law PV = C is related to this process
(a)Adiabatic (b) Isobaric (c) Isochoric (d) Isothermal

4. Dryness fraction(x) of superheated steam is
(a)equal to 0 (b) greater than 1 (c) less than 1 (d) equal to 1

5. Cut-off ratio is related to
(a)Carnot cycle (b) Otto cycle (c) Diesel cycle (d) Rankine cycle

6. The compression ratio for Diesel engine is in the following range:
(a)12 to 22 (b) 5 to 10 (c) 10 to 12 (d) None of the above

7. Gear pump and Vane pump are types of
(a)Rotary pump (b) Reciprocating pump (c) Centrifugal pump
(d) None of the above.

(B) Select the correct answer **07**

1. The work done on compressor is least when the compression is
(a)Isothermal (b) Adiabatic (c) Polytropic (d) None of the above

2. Inter cooling in multi stage compression is used to
(a) cool air (b) Minimize the work done (c) reduce volume of air
(d) none of the above.

3. In the domestic refrigerators the bank of tubes at the back of the refrigerator are
(a)Condenser tubes (b) Evaporator tubes (c) Capillary tubes (d) All of the above

4. Heat is absorbed by refrigerant during refrigeration cycle in
(a)Condenser (b) Evaporator (c) Capillary (d) None of the above

5. The unit of pressure is
(a)Pascal (b) N/m^2 (c) bar (d) all of the above

6. The sealing ring for pressure cooker is made from
(a)Leather (b) Rubber (c) Plastic (d) Aluminum

7. Plate type, Cone type and Centrifugal type are the types of
(a)Couplings (b) Brakes (c) Clutches (d) Gear drives

Q.2 **(a)** Classify the engineering materials. **03**

(b) Explain with neat sketch the working of belt drives and gear drives. **04**

(c) What do you understand by the term 1 ton of refrigeration? What are the main components of vapour compression refrigeration system? Write their functions. **07**

Q.3 **(a)** Differentiate between a Brake and a Clutch. **03**

(b) How the air compressors are classified based on different criteria. **04**

(c) Draw air standard diesel cycle on p-V and T-s diagrams. Derive its efficiency equation with usual notations. **07**

Q.4 **(a)** With neat sketch explain in brief the working of Vane pump. **03**

(b) Compare: S.I. engines and C.I. engines. **04**

(c) The following readings were recorded during the test on single cylinder four stroke diesel engine. **07**

(1)Cylinder diameter = 250 mm
(2) Stroke length = 350 mm
(3) Mean effective pressure = 6.7 bar
(4) Speed of engine = 250 r.p.m.
(5) Net brake load = 1070 N
(6) Effective brake drum diameter = 1.5 m
(7) Fuel consumption rate = 10 kg per hour.
(8) C.V. of the fuel = 44300 kJ/kg.
Calculate: (1) Indicated Power (2) Brake Power (3) Mechanical efficiency. (4) Brake thermal efficiency.

Q.5 **(a)** Explain the difference between boiler mountings and accessories. **03**

(b) Calculate the air standard efficiency of the engine working on Otto cycle in which air initially at 1 bar and 20°C is compressed adiabatically to the pressure of 16 bar. Maximum pressure of cycle is 45 bar and adiabatic index γ =1.4. **04**

(c) With neat sketch explain the construction and working of **07**
(i) Fusible plug and (ii) Air pre heater.

Q.6 **(a)** Prove that $C_p - C_v = R$ with usual notations. **03**

(b) Write a short note on "Solar Energy". **04**

(c) A cylinder contains 0.6 m^3 of a gas at a pressure of 1 bar and 90 °C. The gas is compressed to a volume of 0.18 m^3 by the law $PV^n = C$. The pressure of gas at the end of compression is 5 bar. **07**
Calculate: (1)Mass of gas (2) value of index n (3) The change in internal energy of the gas. (4) Work done (5) The heat received or rejected by the gas during the process. Take γ =1.4 and R= 0.294 kJ/kg K.

Q.7 **(a)** Explain in brief Open system and closed system giving examples. **03**

(b) Draw neat and labeled diagram of Cochran Boiler **04**

(c) Calculate the total amount of heat required to produce 6 kg of steam at a pressure of 6 bar and temperature of 258 °C from the water at 30 °C. Take specific heat of steam = 2.1 kJ/kg-K. and the specific heat of water = 4.187 kJ/kg-K. **07**

****