

Enrollment No: \_\_\_\_\_

Exam Seat No: \_\_\_\_\_

# C.U.SHAH UNIVERSITY

## Winter Examination-2015

**Subject Name : Elements of Mechanical Engineering**

**Subject Code : 4TE01EME1**

**Branch : B. Tech. (All)**

**Semester : 1 Date :07/12/2015 Time :10:30 To 1:30 Marks :70**

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
  - (2) Instructions written on main answer book are strictly to be obeyed.
  - (3) Draw neat diagrams and figures (if necessary) at right places.
  - (4) Assume suitable data if needed.
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- Q-1 Attempt the following questions: (14)**
- 1) In an open system, which crosses the boundary of the system? (01)**  
(a) Energy (b) Work (c) Mass (d) Mass and Energy
  - 2) Choose the extensive properties (01)**  
(a) Pressure (b) Volume (c) Temperature (d) Density
  - 3) An isentropic process is (01)**  
(a) Irreversible and adiabatic (b) Reversible and adiabatic  
(c) Irreversible and friction less (d) Reversible and isothermal
  - 4) During isothermal process, which does not change? (01)**  
(a) Pressure (b) Temperature (c) Volume (d) Both pressure and temperature
  - 5) The Otto cycle is also known as: (01)**  
(a) Constant pressure cycle (b) Constant temperature cycle  
(c) Constant volume cycle (d) Constant entropy cycle
  - 6) The compression ratio in a petrol engine is of order of (01)**  
(a) 5 to 8 (b) 10 to 15 (c) 15 to 20 (d) 25 to 30
  - 7) A boiler may be used to supply steam. (01)**  
(a) For industrial process heating (b) For steam engine  
(c) For power generation (d) All the above



- 8) Babcock and Wilcox boiler is ..... (01)  
 (a) Water tube boiler (b) Multi tube boiler  
 (c) Natural Circulation boiler (d) all of them
- 9) Which of the following is not component of centrifugal pump? (01)  
 (a) Impeller (b) Piston (c) Casting (d) Foot valve
- 10) The reciprocating compressors are suitable for producing (01)  
 (a) High pressure (b) Medium pressure (c) Low pressure (d) None of above
- 11) One ton refrigeration means that (01)  
 (a) 1 ton is total mass of system (b) 1 ton water convert to ice  
 (c) 1 ton refrigerant used  
 (d) Refrigerating effect produce by melting of ice from and at 0°C in 24 hr.
- 12) Jockey pulley used in belt drive to (01)  
 (a) Increase velocity ratio (b) decreases velocity ratio  
 (c) Increase angle of contact (d) decreases angle of contact
- 13) Air standard efficiency of cycle is always (01)  
 (a) Greater than the actual efficiency (b) Less than the actual efficiency  
 (c) Equal to the actual efficiency (d) May be less or more than actual efficiency
- 14) During the adding latent heat, there is change in? (01)  
 (a) Temperature (b) Temperature and Phase (c) Phase only (d) all of above

**Attempt any four questions from Q-2 to Q-8**

**Q-2**

**Attempt all questions**

- (a) What are the various forms of energy? List the nonconventional sources of energy. (04)
- (b) With neat sketch explain construction and working of pressure gauge. (05)
- (c) Find the enthalpy of 1 kg of steam at 12 bar when (i) steam is saturated (ii) steam is 20% wet. (05)

**Q-3**

**Attempt all questions**

- (a) Explain Separating Calorimeter with neat sketch. (04)
- (b) Derive equation  $PV^\gamma = C$  (05)
- (c) The initial volume of 0.9 kg of a certain gas was  $0.75 \text{ m}^3$  at a temperature of  $15^\circ\text{C}$  and a pressure of 1 bar. After adiabatic compression, the volume is reduced to  $0.28 \text{ m}^3$  and pressure was found to be 4 bar. Take Gas constant  $R = 289.352 \text{ J/kg K}$  Calculate: (i)  $C_p$  and  $C_v$  (ii) change in internal energy (05)



- Q-4 Attempt all questions**
- (a) List the main components of Carnot cycle and draw the cycle on P-v and T-s diagram. (04)
- (b) Explain with neat sketch two stroke gasoline engine. (05)
- (c) For an air standard Otto cycle maximum and minimum temperatures are 1350°C and 30°C. Heat supplied is 750 kJ/kg of air. Calculate compression ratio, air standard efficiency, work done/kg of air, ratio of maximum to minimum pressure. (05)
- Q-5 Attempt all questions**
- (a) Write short note on gear drive. (04)
- (b) Explain Oldham's coupling with neat sketch. (05)
- (c) The following observations were recorded during the trial run of single cylinder, two stroke oil engine. (05)
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|-------------------------|----------------|
| Engine torque           | = 650 N.m      |
| Speed                   | = 400 rpm      |
| Cylinder diameter       | = 20 cm        |
| Stroke length           | = 30 cm        |
| Oil consumption         | = 8.5 kg/hr.   |
| Mean effective pressure | = 5.5 bar      |
| Calorific value         | = 42,500 kJ/kg |
- Calculate : (i) Mechanical efficiency (ii) Indicated thermal efficiency
- Q-6 Attempt all questions**
- (a) List various mountings and accessories and describe Dead weight safety valve. (07)
- (b) What is difference between water tube and fire tube boiler? Explain with neat sketch any one water tube boiler. (07)
- Q-7 Attempt all questions**
- (a) What is the function of a pump? Explain with neat sketch, working of centrifugal pump. (07)
- (b) Derive an expression for compressor without clearance  $W = P * V * \log_e^{(P2/P1)}$  for isothermal compression. (07)
- Q-8 Attempt all questions**
- (a) Give the classification of Governing system. Explain with neat sketch Porter governor. (07)
- (b) Explain in detail vapor compression refrigeration system with diagram (07)

