

# C. U. SHAH UNIVERSITY

## Summer Examination-2020

**Subject Name: Elements of Mechanical Engineering**

**Subject Code: 4TE01EME1**

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

**Semester: 1**

**Date: 02/03/2020**

**Time: 02:30 To 05:30**

**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.
- 

- Q-1 Attempt the following questions: (14)**
- (a) A cycle consisting of one constant pressure, one constant volume and two isentropic processes is known as **01**
- A. Carnot cycle
  - B. Stirling cycle
  - C. Otto cycle
  - D. Diesel cycle
- (b) An adiabatic process is one in which **01**
- A. No heat enters or leaves the gas
  - B. The temperature of the gas changes
  - C. The change in internal energy is equal to the mechanical workdone
  - D. All of the above
- (c) The efficiency of Joule cycle is **01**
- A. greater than Carnot cycle
  - B. less than Carnot cycle
  - C. equal to Carnot cycle
  - D. none of these
- (d) The unit of energy in S. I. units is **01**
- A. Joule (J)
  - B. Joule metre (Jm)
  - C. Watt(W)
  - D. Joule/metre (J/m)
- (e) In a four-stroke cycle, the minimum temperature inside the engine cylinder occurs at the **01**
- A. beginning of suction stroke
  - B. end of suction stroke
  - C. beginning of exhaust stroke
  - D. end of exhaust stroke
- (f) A carburetor is used to supply **01**
- A. petrol, air and lubricating oil
  - B. air and diesel



- C. petrol and lubricating oil  
D. petrol and air
- (g) In a four stroke engine, the working cycle is completed in **01**  
A. one revolution of the crankshaft  
B. two revolutions of the crankshaft  
C. three revolutions of the crankshaft  
D. four revolutions of the crankshaft
- (h) The volume of air delivered by the compressor is called **01**  
A. free air delivery  
B. compressor capacity  
C. swept volume  
D. none of these
- (i) Fire tube boilers are **01**  
A. internally fired  
B. externally fired  
C. internally as well as externally fired  
D. none of these
- (j) A safety valve mainly used with locomotive and marine boilers is **01**  
A. lever safety valve  
B. dead weight safety valve  
C. high steam and low water safety valve  
D. spring loaded safety valve
- (k) The ratio of brake power to the indicated power is known as **01**  
A. mechanical efficiency  
B. overall efficiency  
C. indicated thermal efficiency  
D. brake thermal efficiency
- (l) The heat transfer takes place according to **01**  
A. Zeroth law of thermodynamics  
B. First law of thermodynamics  
C. Second law of thermodynamics  
D. Kirchhoff's law
- (m) In air-conditioning of airplanes, using air as a refrigerant, the cycle used is **01**  
A. reversed Carnot cycle  
B. reversed Joule cycle  
C. reversed Brayton cycle  
D. reversed Otto cycle
- (n) Multi-stage centrifugal pumps are used to **01**  
A. give high discharge  
B. produce high heads  
C. pump viscous fluids  
D. all of these



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

- Q-2 Attempt all questions (14)**
- a) What are the various forms of energy? Define prime movers. Classify the prime movers. 07
  - b) With neat sketch explain construction and working of pressure gauge. 07
- Q-3 Attempt all questions (14)**
- a) 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 07
  - b) With neat sketch explain working of combine separating and throttling calorimeter. 07
- Q-4 Attempt all questions (14)**
- a) What is difference between water tube and fire tube boiler? Explain with neat sketch any one water tube boiler. 07
  - b) What is the function of a pump? Explain with neat sketch, working of centrifugal pump. 07
- Q-5 Attempt all questions (14)**
- a) What is the difference between governor and flywheel? 02
  - b) Write advantage of chain drive over belt drive. Draw neat sketches of simple and compound gear train. 05
  - c) Derive an expression for compressor without clearance  $W = P * V * \log_e^{(P_2/P_1)}$  for isothermal compression. 07
- Q-6 Attempt all questions (14)**
- a) Explain in detail vapor compression refrigeration system with diagram. 07
  - b) In an air standard Otto cycle the maximum and minimum temperatures are 1400 and 15 . The supplied per kg of air is 800 kJ. Calculate the compression ratio and cycle efficiency. Take  $C_v = 0.718 \text{ kJ/kg-K}$ ,  $\gamma = 1.4$  07
- Q-7 Attempt all questions (14)**
- a) Write the comparison between two stroke and four stroke cycle engines. 06
  - b) Explain the following term: 08
    - (i) Manometric head
    - (ii) Slip
    - (iii) Free Air Delivery
    - (iv) brake thermal efficiency
- Q-8 Attempt all questions (14)**
- a) Classify various types of brakes, explain any one with neat sketch and also write its functions. 07
  - b) Classify various types of couplings and explain Oldham coupling with neat sketch. 07

