

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.
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- 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 m^3 at a temperature of 15°C and a pressure of 1 bar. After adiabatic compression, the volume is reduced to 0.28 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 $W = P * V * \log_e^{(P2/P1)}$ 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**

