Enrollment No: _____ Exam Seat No: _____

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 is 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℃ 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 J/kg K Calculate: (i) Cp and Cv (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 Cv =0.718 kJ/kg-K, γ =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**