

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name: Elements of Mechanical Engineering

Subject Code: 4TE01EME1

Branch: B.Tech (All)

Semester: 1

Date: 19/03/2019

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) What is non-flow process?	01
	(b) Define Dryness fraction.	01
	(c) Distinguish between heat and work.	01
	(d) State the zeroth law of thermodynamics.	01
	(e) Give the uses of compressed air.	01
	(f) What is refrigerating effect?	01
	(g) Which type of brake is widely used in automobiles?	01
	(h) For same compression ratio, the thermal efficiency of otto cycle is.....diesel cycle.	01
	(i) What is the average overall thermal efficiency of diesel engine?	01
	(j) Distinguish between gas and Vapor.	01
	(k) Write the applications of First law of thermodynamics.	01
	(l) List various mountings and accessories used in boiler.	01
	(m) List the essential components of heat engine.	01
	(n) State the limitation of Carnot cycle.	01

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

Q-2	Attempt all questions	(14)
	a) What are the various forms of energy? List the nonconventional sources of energy.	04
	b) Explain throttling Calorimeter with neat sketch.	04
	c) With neat sketch explain construction and working of pressure gauge.	06
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) Discuss various types of non-flow processes and derive $PV^\gamma = \text{constant}$, Where $\gamma = C_p/C_v$	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) Discuss briefly Otto cycle with the help of P-V diagram and derive an expression for the ideal efficiency of Otto cycle. **07**

Q-5 Attempt all questions (14)

- a) Write short note on gear drive. **04**
- b) Define the following with formula: **04**
- (i) Compression Ratio
 - (ii) Coefficient of Performance
 - (iii) Slip
 - (iv) Free Air Delivery
- c) Give the classification of Governing system. Explain with neat sketch Porter governor. **06**

Q-6 Attempt all questions (14)

- a) During testing of single cylinder two stroke oil engines, following data were obtained. **07**
 Brake torque = 640 N-m, cylinder diameter = 21 cm, speed = 350 rpm, stroke = 28 cm, mean effective pressure = 5.6 bar, oil consumption = 8.16 kJ/hr, calorific value = 42705 kJ/kg. Determine:
- (i) mechanical efficiency
 - (ii) indicated thermal efficiency
 - (iii) brake thermal efficiency
 - (iv) specific fuel consumption.
- b) What is the function of a pump? Explain with neat sketch, working of centrifugal pump. **07**

Q-7 Attempt all questions (14)

- a) 1 kg of air at 7 bar pressure and 90° C temperature undergoes a non-flow polytropic process. The law of expansion is $pV^{1.1} = \text{constant}$. The pressure falls to 1.4 bar during the process. Calculate : (1) Final temperature (2) Work done (3) Change in internal energy (4) Heat exchange **07**
 Take $R = 287 \text{ J/kg K}$ and $\gamma = 1.4$ for air.
- b) Explain with neat sketch construction and working of vane type compressor. **04**
- c) Differentiate between brake and clutch. Explain Band brake. **03**

Q-8 Attempt all questions (14)

- a) Classify various types of coupling and explain Oldham coupling with neat sketch. **07**
- b) Explain in detail vapor compression refrigeration system with sketch. **07**

