

# 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.

<b>Q-1</b>	<b>Attempt the following questions:</b>	<b>(14)</b>
	(a) What is non-flow process?	<b>01</b>
	(b) Define Dryness fraction.	<b>01</b>
	(c) Distinguish between heat and work.	<b>01</b>
	(d) State the zeroth law of thermodynamics.	<b>01</b>
	(e) Give the uses of compressed air.	<b>01</b>
	(f) What is refrigerating effect?	<b>01</b>
	(g) Which type of brake is widely used in automobiles?	<b>01</b>
	(h) For same compression ratio, the thermal efficiency of otto cycle is.....diesel cycle.	<b>01</b>
	(i) What is the average overall thermal efficiency of diesel engine?	<b>01</b>
	(j) Distinguish between gas and Vapor.	<b>01</b>
	(k) Write the applications of First law of thermodynamics.	<b>01</b>
	(l) List various mountings and accessories used in boiler.	<b>01</b>
	(m) List the essential components of heat engine.	<b>01</b>
	(n) State the limitation of Carnot cycle.	<b>01</b>

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

<b>Q-2</b>	<b>Attempt all questions</b>	<b>(14)</b>
	a) What are the various forms of energy? List the nonconventional sources of energy.	<b>04</b>
	b) Explain throttling Calorimeter with neat sketch.	<b>04</b>
	c) With neat sketch explain construction and working of pressure gauge.	<b>06</b>
<b>Q-3</b>	<b>Attempt all questions</b>	<b>(14)</b>
	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	<b>07</b>
	b) Discuss various types of non-flow processes and derive $PV^\gamma = \text{constant}$ , Where $\gamma = C_p/C_v$	<b>07</b>
<b>Q-4</b>	<b>Attempt all questions</b>	<b>(14)</b>



- 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**

