

Enrollment No:-\_\_\_\_\_

Exam Seat No:-\_\_\_\_\_

# C.U.SHAH UNIVERSITY

Summer-2015

Subject Code: 4TE01EME1

Subject Name: Elements of Mechanical Engineering

Course Name: B.Tech

Date: 7/5/2015

Semester:I

Marks: 70

Time:10:30 TO 01:30

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**Instructions:**

- 1) Attempt all Questions of both sections in same answer book/Supplementary.
  - 2) Use of Programmable calculator & any other electronic instrument prohibited.
  - 3) Instructions written on main answer book are strictly to be obeyed.
  - 4) Draw neat diagrams & figures (if necessary) at right places.
  - 5) Assume suitable & perfect data if needed.
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- Q-1 (a) Describe Thermodynamic systems with neat sketch. 05  
(b) Explain with neat sketch working and construction of Throttling Calorimeter. 05  
(c) Give the differences between governor and flywheel. 04
- Attempt any Four.**
- Q-2 (a) Derive the expression  $pV = mRT$  with the help of Boyle's law and Charler's law. 07  
(b) 5 Kg of air is heated from an initial volume of  $0.5 \text{ m}^3$  to final volume of  $1.3 \text{ m}^3$  at constant pressure 4 bar. Determine (i) heat supplied, (ii) Work done, (iii) initial and final temperatures of air. 07  
Take  $C_p = 1.005 \text{ kJ/kg K}$  and  $R = 0.287 \text{ kJ/kg K}$
- Q-3 (a) Derive equation for air standard efficiency of Diesel Cycle. 07  
(b) In an air standard Otto cycle the maximum and minimum temperatures are  $1400^\circ\text{C}$  and  $15^\circ\text{C}$ . The heat supplied per kg of air is 800 kJ. Calculate the compression ratio and cycle efficiency. Take  $C_v = 0.718 \text{ kJ/kg K}$  and  $\gamma = 1.4$ . 07
- Q-4 (a) Discuss the working of Lancashire boiler with neat sketch. 07  
(b) Explain with neat sketch (i) Fusible Plug (ii) Blow off cock 07
- Q-5 (a) Write the differences between two- stroke and four- stroke cycle. 07  
(b) A two stroke Internal combustion engine has a stroke length of 140 mm and cylinder bore 90 mm. Its mean effective pressure is 5.4 bar and speed of the engine is 1000 rpm. Determine brake power of the engine. Assume mechanical efficiency as 85% 07



- Q-6 (a) Define volumetric efficiency with PV diagram and usual notations. Prove that volumetric efficiency of reciprocating compressor is  $1 - C[(P_2/P_1)^{1/n} - 1]$ . 07
- (b) A single stage reciprocating compressor takes in  $7.5 \text{ m}^3/\text{min}$  of air at 1 bar and  $27^\circ\text{C}$ . The air is compressed to 5.5 bar polytropically with index  $n = 1.3$ . The clearance is 6% of stroke volume. (i) Volumetric efficiency (ii) Indicated Power. 07
- Q-7 (a) With a line diagram explain the working of Window air conditioning system. 07
- (b) Explain following terms associated with pumps: (i) Priming in Pumps (ii) Head (iii) Air chamber 07
- Q-8 (a) Explain with neat sketch working of disc clutch. 07
- (b) Draw neat and labeled sketches of following 07
- (i) Open belt drive
  - (ii) Quarter twist drive
  - (iii) Fast and loose pulley drive
  - (iv) Stepped pulley drive

