

A. D. Patel Institute of Technology (ADIT)
Internal Examination
First Semester 2008-09
First Level Mechanical Engineering

Subject Code: ME101 Date: 15-10-2008
Subject Name: Elements of Mechanical Engineering Time: 8 to 9 a.m.
Level: First Total Marks: 20

Notes:

- 1) Assume suitable data if required
- 2) Figures to the right indicate maximum marks

Q: 1 Answer the following questions. (Each of two marks) [10]
 (i) Define intensive and extensive property with example.
 (ii) Explain process, path, state and closed system.
 (iii) What are the advantages and disadvantages of liquid fuels over solid fuels?
 (iv) Prove $W.D. = (p_1v_1 - p_2v_2)/(n - 1)$ in polytropic process.
 (v) Define H.C.V. and L.C.V.

Q: 2 1 kg of gas is compressed polytropically from a pressure of 150 kPa and 250k to 750 kPa. If the compression is according to law $pv^{1.3} = \text{constant}$ find, [04]
 (i) The initial volume
 (ii) The work done
 (iii) Heat transfer during the process
 (iv) Final temperature
 (v) Change in I.E.
 (vi) Change in enthalpy

Q: 3 A sample of wet steam at a pressure of 30 bar has dryness fraction of 0.85. Determine [03]
 its enthalpy, volume, entropy per kg.

p (bar)	t (°C)	v_f (m ³ /kg)	v_g (m ³ /kg)	h_f (kJ/kg)	h_{fg} (kJ/kg)	h_g (kJ/kg)	s_f (kJ/kgK)	s_{fg} (kJ/kgK)	s_g (kJ/kgK)
30	233.84	0.001216	0.06663	1008.4	1793.9	2802.3	2.664	3.538	6.184
35	242.54	0.001235	0.05703	1049.8	1752.2	2802.0	2.725	3.398	6.123

Q: 4 An engine working on Otto cycle, air has a pressure of 1 bar and temperature of 27⁰ C. Air [03]
 is compressed adiabatically with a compression ratio of 7 and then heat is added at constant volume till the temperature rises to 2000 K. Find the standard efficiency pressure of air at the end of compression and heat addition process and mean effective pressure of the cycle. Assume,
 $c_v = 0.718$ kJ/kgK
 $\gamma = 1.4$
 $R = 287$ Nm/kg