B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) / BTMEVI

00345

Term-End Examination

June, 2015

BME-019 : ENGINEERING THERMODYNAMICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks.*

1. (a) What is a Thermodynamic system ? Explain its types. *5*

(b) Explain intensive and extensive properties with examples. *5*

2. (a) Explain Bourdon pressure gauge with a neat sketch. *5*

(b) Explain Zeroth law of Thermodynamics. *5*

3. (a) Explain Absolute temperature scale. 5

(b) A temperature scale of a certain thermometer is given by $t = a\ ln\ P + b$, where 'a' and 'b' are constants and 'P' is the thermometric property of the fluid in the thermometer. If the ice point and steam point thermometric properties are found to be 1·5 and 7·5 respectively, what would be the temperature corresponding to the thermometric property of 3·5 on Celsius scale ? 5

4. (a) What is heat ? Give sign convention. How is it related to work ? 5

(b) Explain Joule's experiment to prove I-law of thermodynamics $\oint \delta W = \oint \delta Q$. 5

5. (a) Derive the equations for Clausius inequality. 7

(b) What is entropy ? Explain. 3

6. (a) What is reversibility and irreversibility ? Explain. 5

(b) Prove that change of entropy for unit mass is given by,

$$s_2 - s_1 = C_p\ ln\ \frac{v_2}{v_1} + C_v\ ln\ \frac{P_2}{P_1}.$$ 5

7. (a) Discuss available and unavailable energy. 5

(b) State and explain the two statements of II-law of thermodynamics. 5

8. (a) Discuss various refrigerants. 4

(b) Discuss the following terms :

(i) Ton of refrigeration

(ii) COP

(iii) Compressor power 6

9. (a) Explain Reversed Brayton Cycle. 5

(b) An air compressor has a volumetric efficiency of 70% when tested, the discharge state being 5 bar, 150°C and inlet state is 1 bar & 15°C. If the clearance is 4%, predict the new η_{vol}, when the discharge pressure is increased to 700 kPa. Assume that the ratio of real to ideal η_{vol} of the exponent 'n' remains constant. 5

10. (a) Derive the expression for work input of a single stage reciprocating air compressor. 6

(b) What are the uses of high pressure air ? 4