| BME-019

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

01455

Term-End Examination

December, 2014

BME-019 : ENGINEERING THERMODYNAMICS

Time : 3 hours   *Maximum Marks : 70*

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

1. (a) Explain Thermodynamic systems with suitable examples.   *5*

    (b) Discuss various Thermodynamic properties.   *5*

2. (a) Define pressure. Give the relationship between absolute pressure, atmospheric pressure and gauge pressure.   *5*

    (b) Explain Zeroth law of Thermodynamics. Give one example.   *5*

3. (a) Discuss Kelvin Temperature Scale. *5*

(b) The temperature readings t_1 and t_2 of two *Celsius* thermometers agree at the ice point and at the steam point. They are related by the equation $t_1 = A + Bt_2 + Ct_2^2$ between these two points, where A, B and C are constants. When both are immersed in an oil bath, t_1 is 51°C and t_2 is 50°C. Determine the value of t_1 when t_2 reads 25°C. *5*

4. (a) Compare work and heat. *5*

(b) Explain Joule's experiment to prove $\oint \delta W = \oint \delta Q$. *5*

5. (a) Explain Carnot cycle and Carnot engine. *5*

(b) Explain the terms reversibility and irreversibility with the help of suitable examples. *5*

6. (a) Take three hypothetical heat engines A, B and C, each operating between 1,000 K and 300 K. When each engine involves itself with a heat interaction of 1,000 kJ with HTR, it is claimed that while 'A' develops a work of 600 kJ, B and C develop 700 kJ and 800 kJ. Use the Carnot statement and identify the engines A, B and C as reversible, irreversible, or impossible. *6*

(b) What is entropy ? Explain that the entropy of Universe always tends to increase. *4*

7. (a) Explain available and unavailable energy. *5*

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

$$s_2 - s_1 = C_v \, ln \, \frac{T_2}{T_1} + R \, ln \, \frac{v_2}{v_1}.$$ *5*

8. (a) Explain Vapour Compression Refrigeration system. *5*

(b) Explain any *two* of the following : *5*

(i) Refrigerating effect

(ii) Capacity of VCRs

(iii) Ton of refrigeration

9. (a) With a neat sketch explain Brayton cycle. *5*

(b) Derive the equation for volumetric efficiency of reciprocating air compressors. *5*

10. (a) What is intercooling ? Explain with a PV diagram of 2-stage reciprocating air compressor. 5

(b) Derive the expression for work input for single stage reciprocating air compressor. 5

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