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ET-201(B)

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering) / B.Tech. (Aerospace Engineering)

Term-End Examination

00385

June, 2017

ET-201(B) : ENGINEERING THERMODYNAMICS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **seven** questions. All questions carry equal marks. Use of steam tables and scientific calculator is permitted.*

1. (a) Explain the following in brief with suitable examples : *4*

(i) Macroscopic Approach

(ii) Microscopic Approach

(b) Define Pressure. Express the relationship among absolute pressure, atmospheric pressure, gauge pressure and vacuum. *6*

2. (a) State the zeroth law of thermodynamics. The 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 while t_2 is 50°C. Determine the value of t_1 when t_2 reads 25°C. *8*

(b) What are the modes of heat transter ? *2*

3. State the steady flow energy equation (SFEE). Derive the SFEE for a steam turbine. *10*

4. (a) State the second law of thermodynamics. Explain open cycle gas turbine power plant. *5*

(b) In a steam power plant the work output of the turbine is 100 kJ while heat supplied at the boiler is 300 kJ. Given that during the same period work input to the pump is 0·5 kJ, find the heat rejected at the condenser and thermal efficiency of the plant. *5*

5. Explain the following : $4 \times 2\frac{1}{2}$

(a) Reversible Process

(b) Irreversible Process

(c) Reversible Heat Engine

(d) Coefficient of Performance (COP)

6. (a) Calculate the value of C_v for air (M = 28·97 kg/kmol) assuming its C_p to be 1005 J/kg-K. *5*

(b) Derive the expression *5*

$$C_p - C_v = R$$

7. (a) A closed tank contains 12 kg of nitrogen at 40 MPa and 200°C. Compute the pressure that results if the temperature is lowered to – 75°C. *5*

(b) Define dryness fraction. How is dryness fraction measured ? *5*

8. (a) Derive the relationship for work of compression in a steady flow. *7*

(b) Explain the significance of intercooling in multistage compression. *3*

9. With a neat diagram, explain the working of a vapour absorption refrigeration system. *10*