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ET-201(B)

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

01405

Term-End Examination

June, 2014

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 calculator is permitted.*

1. (a) Compare System and Control volume. *5*

(b) Define property. Classify properties. Explain with suitable examples. *5*

2. (a) Show the relationship among absolute pressure, atmospheric pressure, gauge pressure and vacuum pressure. *5*

(b) Explain the fundamental of Relaxation Time. *5*

3. (a) A closed system has undergone a change from its original state 1 to final state 2 during a certain process (shown in figure 1). Calculate the work done during this process. 5

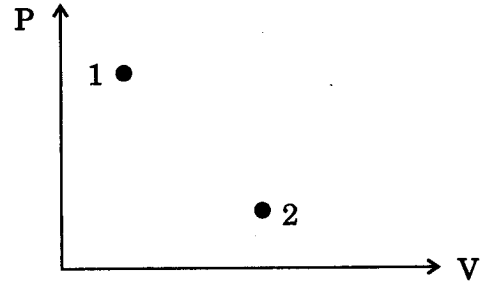

Figure 1

(b) A coal-fired power plant has its electric power output of 500 MW. This represents 28% of the Energy input from the coal fired in the boiler. The coal liberates as much as 29·5 MJ of Internal Energy per kg of the coal burnt. Determine the mass of coal fired per hour. 5

4. (a) Explain any ***three*** of the following terms : 2×3

(i) Heat

(ii) Work

(iii) Conduction

(iv) Convection

(b) Compare the following : 2×2

(i) Work and Heat

(ii) Heat and Energy

5. (a) Drive Steady Flow Energy Equation for pure substance. 5

(b) Discuss the following equations : $2\frac{1}{2}\times2$

(i) Application of SFEE

(ii) Continuity Equation

6. Properties of air in the closed cycle gas turbine are as follows :

Location	Temperature °C	Velocity (m/s)
Between cooler and compressor	35	95
Between compressor and heater	240	35
Between heater and turbine	t_3	220
Between turbine and cooler	525	110

The heat transfer to air in the heater is 640 kJ/kg air. Assume no heat loss from any component to atmosphere. Find $2\frac{1}{2}\times4$

(a) t_3

(b) Heat transfer in cooler

(c) Net work output

(d) Thermal Efficiency of plant

Assume

(i) Enthalpy of air is a function of its temperature.

(ii) C_p = 1·005 kJ/kg-K

7. (a) "Energy is said to be degraded each time it flows through a finite temperature difference." Justify this statement. *5*

(b) (i) What do you mean by availability ? Explain. *3*

(ii) Define Dead State. *2*

8. (a) What is the Internal Energy of saturated water vapours at 120·23°C ? *5*

(b) Wet steam at 1 bar has an entropy of 2·2 kJ/kg-K. Find its specific enthalpy and volume. *5*

9. Explain :

(i) Brayton cycle *5*

(ii) Aircraft cooling system *5*

10. Explain any ***four*** of the following : $2\frac{1}{2} \times 4$

(i) Barriers of Energy Conservation

(ii) Energy Audit

(iii) Integrated Approach

(iv) Waste heat Recovery

(v) Concept of Efficiency

(vi) Fossil fuel combustion processes
