

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

Term-End Examination

00008

June, 2016

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) Explain Clausius statement with a suitable example.
- (b) A pressure gauge is attached to a closed tank which contains some gas. The gauge reads 1.3 bar, when the barometer reads 75 cm of Hg. If the barometer changes to 72 cm of Hg, what will be the reading on the gauge for the same absolute pressure ?

3+7

2. (a) Describe the following :

(i) Entropy

(ii) Internal Energy

(b) A barometer reads 76 cm of Hg. Determine the absolute pressure when

(i) a pressure gauge connected to a steam main line leading to inlet of a steam turbine reads 28 bars, and

(ii) a vacuum gauge connected to the exhaust line of the same turbine reads equivalent to 910 cm of water column.

Express the absolute pressure in both cases in kPa. 3+7

3. (a) Explain the triple point using a suitable diagram.

(b) A domestic food freezer maintains a temperature of 15°C . The ambient air temperature is 30°C . If heat leaks into the freezer at a continuous rate of 1.75 kJ/s , what is the minimum power required to pump this heat out continuously? 3+7

4. (a) What is the difference between intensive and extensive properties ? Give examples.
- (b) In an ideal air cycle refrigeration system, air enters the compressor at 1 bar, 5°C and is compressed to 3 bar. The air is then cooled at constant pressure to 50°C and then expanded in a turbine to 1 bar. The cooling capacity of the system is 10 kW. Assume air behaves as a perfect gas with $C_p = 1.005 \text{ kJ/kg.K}$ and $C_v = 0.718 \text{ kJ/kg.K}$. Find the COP, mass flow rate of air and the power required by the system. 3+7
5. (a) Describe a simple vapour compression refrigeration cycle with the help of a flow diagram.
- (b) The bore and stroke of an engine cylinder are 18 cm and 32 cm, respectively. The clearance volume is 0.00254 m^3 . If the engine works on Otto cycle, find the compression ratio and the air standard efficiency. 5+5
6. (a) What is meant by volumetric efficiency of a reciprocating compressor ? State at least six uses of compressed air.
- (b) Discuss the pressure and its measurement and also relationships among absolute pressure, atmospheric pressure, gauge pressure and vacuum. 5+5

7. (a) What is the significance of energy for national economy development ?
- (b) The temperature of 3.5 kg of gas in a rigid container is increased from 22°C to 39°C by heating it. The heat transferred during the heating process is 25 kJ. The specific heat ratio and the molar mass of the gas are 1.4 and 28, respectively. Calculate the work done and change in internal energy for the gas, treating the gas to be a perfect gas. 3+7
8. (a) What are the major functions and duties of an energy manager ? Explain.
- (b) Explain with a neat sketch the Steam Jet Refrigeration system. 5+5
9. (a) What do you understand by dry and wet compression ? Which is preferred and why ?
- (b) Explain the following with neat diagrams :
- (i) Constant Pressure Processes
- (ii) Constant Volume Processes 5+5
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