

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

Term-End Examination

00372

June, 2018

ET-201(B) : ENGINEERING THERMODYNAMICS

Time : 3 hours

Maximum Marks : 70

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

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1. (a) Define system, surroundings and boundary. Also describe how pressure difference between two points is measured using manometer. 7
 - (b) Prove that 'Internal Energy' is a property of steam. 7
 2. (a) State and explain the First Law of Thermodynamics for a closed system undergoing process. 7
 - (b) What is meant by reversible and irreversible processes ? Give examples of each. 7

3. (a) Explain the working of Carnot cycle with the help of P-V and T-S diagram. 7
- (b) A small turbine working under the following conditions runs an aircraft refrigeration unit. Air at 4 bar and 40°C flows steadily into a turbine at 40 m/s. At the turbine exit, the condition of the air is 1.0 bar, 2.5°C and 200 m/s. The shaft work delivered by the turbine is 52 kJ/kg of air. Determine the heat transfer per kg of air flowing through the turbine. 7
4. (a) State and explain the Clausius Statement of the Second Law of Thermodynamics. 7
- (b) 10 kg of air is heated at constant pressure, from a temperature of 100°C to 200°C . Calculate the heat added during the process and also the change in internal energy. Take gas constant $R = 0.287\text{ kJ/kg}\cdot\text{K}$, and $\gamma = 1.4$ for air. 7
5. (a) Describe the working of an ideal reheat Rankine cycle. Also explain the advantages of a reheat Rankine cycle. 7
- (b) A refrigerator removes heat at an average rate of 760 MJ/h from the cold compartment. If the coefficient of performance of the refrigerator is 4.0, determine (i) the power input to the refrigerator, and (ii) the amount of heat rejected by the refrigerator. 7

6. (a) Explain the working of a vapour absorption refrigeration system with suitable diagram. 7
- (b) What are the various types of feedwater heaters used in regenerative Rankine cycle? Explain its properties. 7
7. (a) Explain the concept of available and unavailable energy. When does the system become dead? 7
- (b) Water changes from saturated liquid to saturated vapour as heat is transferred to it from a source at 300° C, in a steady flow Carnot cycle. Heat rejection is at a constant pressure of 10 kPa. Draw the T-S diagram for the cycle relative to the saturation lines, and determine the amount of heat rejected, the thermal efficiency of the cycle and the net work output. 7
8. Write short notes on any *four* of the following : $4 \times 3 \frac{1}{2} = 14$
- (a) Thermal Convection
 - (b) Enthalpy
 - (c) Closed System
 - (d) Topping Cycle
 - (e) Isentropic Process
 - (f) Availability