**B.Tech Odd Semester (CBCS) Exam.,
December—2018**

AGRICULTURAL ENGINEERING

(3rd Semester)

Course No. : AECC–03

(Thermodynamics and Heat Engines)

Full Marks : 50
Pass Marks : 15

Time : 2 hours

Note : 1. Answer any **five** questions.

2. Begin each answer in a new page.

3. Answer parts of a question at a place.

4. Assume reasonable data wherever required.

5. The figures in the margin indicate full marks for the questions.

1. Distinguish between the following : 2×5=10

   (a) Homogeneous and heterogeneous systems

   (b) Cyclic and non-cyclic processes

   (c) Steady and unsteady flow processes

   (d) Internal energy and enthalpy

   (e) Thermodynamic system and control volume

(*Turn Over*)

2. (a) With the neat sketch, explain the famous 'Joule's experiment' to show that energy transfer to an adiabatic system is a function of end state only. 6

   (b) Define specific heat at constant pressure. Also find an equation of heat transfer at constant pressure. 2+2=4

3. What is work transfer? Describe the displacement work, paddle wheel work, flow work, and shaft work. 2+8=10

4. Discuss the following with examples : 3+3+4=10

   (a) Zeroth law of thermodynamics

   (b) Thermodynamic property

   (c) Quasistatic process

5. (a) Define enthalpy. Why does the enthalpy of an ideal gas depend only on temperature? 5

   (b) A domestic refrigerator is loaded with food and the door closed. During a certain period, the machine consumes 1 kWh of energy and the internal energy of the system drops by 5000 kJ. Find the net heat transfer for the system. 5

6. (a) Represent schematically heat pump, and refrigerator. Give their performances. 6

(*Continued*)

(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 the continuous rate of 1·75 kJ/s, what is the least power necessary to pump this heat out continuously? 4

7. What is a Carnot cycle? Explain the four processes which constitute the cycle and also represent on *P-V* diagram. 10

8. *(a)* Establish the equivalence of Kelvin-Planck and Clausius statements. 4

(b) State the four processes of the Diesel cycle. 3

(c) Represent the Otto cycle on *P-V* diagram. 3

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