**B.Tech Odd Semester (CBCS) Exam.,
December—2017**

AGRICULTURAL ENGINEERING

(3rd Semester)

Course No. : AECC-03

(Thermodynamics and Heat Engines)

Full Marks : 50
Pass Marks : 15

Time : 2 hours

Note : 1. Attempt *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) Closed, open and isolated systems

(b) Homogeneous and heterogeneous systems

(c) Steady and unsteady flow processes

(d) Internal energy and enthalpy

(e) Thermodynamic work and heat

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2. *(a)* What do you understand by thermodynamic equilibrium? Explain mechanical, chemical and thermal equilibrium. 2+4=6

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

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

4. *(a)* Define enthalpy. Why does the enthalpy of an ideal gas depend only on temperature? 2+3=5

(b) When the valve of the evacuated bottle is opened, atmospheric air rushes into it. If the atmospheric pressure is 101·325 kPa and 0·6 m^3 of air (measured at atmospheric conditions) enters into the bottle, calculate the work done by air. 5

5. What is steady flow process? Derive an expression for steady flow energy equation (S.F.E.E) for a single stream entering and a single stream leaving a control volume. 2+8=10

(**3**)

6. *(a)* Represent schematically heat pump and refrigerator. Give their performance. 7

(b) A cyclic heat engine operates between a source temperature of 800 °C and a sink temperature of 30 °C. What is the least rate of heat rejection per kW net output of the engine? 3

7. What is Otto cycle? Derive an expression for calculating the efficiency of an Otto cycle. 10

8. *(a)* Represent the Carnot heat engine cycle on *P-V* diagram. 3

(b) State the four processes of the diesel cycle. 4

(c) How is the compression ratio at an SI engine fixed? 3

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