KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Engg) 2018 Admission
II Semester Final Examination-July 2019

Meen.1203   **Engineering Thermodynamics (2+1)**

Marks: 50
Time:2 hours

I   **Fill up the following blanks:**   **(10x1=10)**

1   A cycle consisting of one constant pressure, one constant volume and two isentropic processes is known as _____ .

2   An isothermal process is governed by _____ Law

3   According to Gay-Lussac law, the absolute pressure of a given mass of a perfect gas varies _____ as its absolute temperature, when the volume remains constant.

4   The measurement of a thermodynamic property known as temperature is based on_____ law of thermodynamics.

5   According to Kelvin-Planck's statement, a perpetual motion of the _____ is impossible.

State whether true or false

6   The state of a substance whose evaporation from its liquid state is partial, is known as steam.

7   Both the Ericsson cycle and Joule's cycle have two constant pressure processes.

8   Define volumetric efficiency of a reciprocating air compressor

9   State Clausius statement

10   Draw the P-v diagram for an Otto Cycle and mark the processes

II   **Write Short notes on any FIVE of the following**   **(5x2=10)**

1   Kelvin- Planck statement of second law of thermodynamics.

2   Polytropic processes

3   Air compressors and its uses

4   Charle's law

5   Dryness fraction and Superheated steam

6   Steady flow energy equation

7   Concepts on entropy

III   **Answer any FIVE of the following.**   **(5x4=20)**

1   State and prove Clausius theorem

2   A reversible heat engine operates with two environments. In the first, it draws 12000KW from a source at 400°C and in the second, it draws 25000KW from a source at 100°C. In both the operations, the engine rejects heat to a thermal sink at 20°C. Determine the operation in which the engine delivers more power.

3   A stationary mass of gas is compressed without friction from an initial state of 0.3 m^3 and 0.105 M.pa to a final state of 0.15m^3 and 0.105M.pa, the pressure remaining constant during the process. There is a transfer of 37.6 kJ of heat from the gas during the process. How much does the internal energy of the gas change?

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4 Sketch the T-S and P-V diagram of a diesel cycle. Mention the various processes of diesel cycle.

5 What are specific heats. Derive the relation between Cp and Cv.

6 A single stage single acting reciprocating air compressor is required to handle $30m^3$ of free air per hour measured at 1 bar. The delivery pressure is 6.5 bar and the speed is 450 r.p.m allowing volumetric efficiency of 75%; an isothermal efficiency of 76% and mechanical efficiency of 80%. Find the indicated mean effective pressure.

7 What are the uses of an Intercooler

IV   **Answer any ONE of the following**   **(1x10=10)**

1 Define volumetric efficiency and derive an expression for the volumetric efficiency of a reciprocating compressor with clearance volume.

2 Derive an equation for air standard efficiency of an Otto cycle with P-v and T-s diagrams

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