Exam.Code:0939
Sub. Code: 7041

1129

M.E. (Mechanical Engineering)
Third Semester
MEC-301: Applied Thermodynamics – I

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

a) Define thermodynamics and discuss different approaches to study of thermodynamics

b) State the Dalton's law of partial pressures and assumptions for it.

c) State Zeroth law of thermodynamics.

d) Define entropy.

e) Write names of different types of thermodynamic processes.

f) Define performance parameter for refrigerator.

g) Describe the principle of steam turbine operation.

h) What do you understand by condenser?

i) What is choked flow in nozzle?

j) What is function of economiser? (10x1)

UNIT – I

II. a) An engine cylinder has a piston of area 0.12 m^3 and contains gas at a pressure of 1.5 MPa. The gas expands according to a process which is represented by a straight line on a pressure-volume diagram. The final pressure is 0.15 MPa. Calculate the work done by the gas on the piston if the stroke is 0.30 m.

b) Explain, how the Zeroth law of thermodynamics can be used for temperature measurement. (6,4)

III. a) An electric storage battery which can exchange heat only with a constant temperature atmosphere goes through a complete cycle of two processes. In process 1-2, 2.8 kWh of electrical work flow into the battery while 732 kJ of heat flow out to the atmosphere. During process 2-1, 2.4 kWh of work flow out of the battery.

i) Find the heat transfer in process 2-1'.

ii) If the process 1-2 has occurred as above, does the first law or the second law limit the maximum possible work of process 2-1? What is the maximum possible work?

P.T.O.

iii) If the maximum possible work were obtained in process 2-1, what will be the heat transfer in the process?

b) Show that internal energy is a property. (7,3)

IV. a) Explain the working of Striling boiler.

b) Write unique features of Fire tube boiler. (7,3)

UNIT – II

V. a) In a steam nozzle the expansion pressure ratio of 7.5 is achieved with steam entering at 300°C and leaving at 2 bar. For the steam mass flow rate of 1.2 kg/s determine the throat area considering adiabatic expansion in the absence of friction loss.

b) Derive the expression of velocity of fluid leaving nozzle, considering flow to be frictionless and adiabatic. (6,4)

VI. a) Sketch the velocity diagram of a two stage velocity compounded turbine.

b) A Parson's reaction turbine has mean diameter of blades as 1.6 m and rotor moving at 1550 rpm. The inlet and outlet angles are 80° and 20° respectively. Turbine receives steam at 12 bar, 200°C and has isentropic heat drop of 26 kJ/kg. 5% of steam supplied is lost through leakage. Determine the following considering horse power developed in stage to be 610 hp. (4,6)

VII. a) Discuss the effect of air leakage upon the performance of condenser.

b) Describe the velocity diagram for single stage impulse turbine. Also obtain the expressions for force, work done, diagram efficiency, gross stage efficiency and axial thrust. (4,6)

x-x-x