Exam.Code:0939
Sub. Code: 6700

2063
B.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 Part. Use of steam table allowed. Make suitable assumptions in case of missing data.

x-x-x

1. (a) Write Equivalence of Clausius statement to the Kelvin-Plank statement.

(b) What is throttling process.

(c) What is difference between heat engine and heat pump.

(d) What is Dryness fraction.

(e) What are differences between water-tube and fire- tube boilers.

(f) What is a function of Diffuser.

(g) What is principle of reaction turbine.

(h) What is Reheat factor in impulse steam turbine.

(i)What is difference between reversible and Irreversible Processes.

(j).What is Dalton's law of partial pressure.

(1*10= 10)

PART-A

2.(a) Describe the effect of pressure, temperature and vaccum on the Rankine efficiency. (5)

(b) A cyclic heat engine operates between a source temperature of 1000° C and a sink temperature of 40° C. Find the least rate of heat rejection per kW net output of the engine. (5)

3.(a)Steam at a 6.87 bar, 205° C, enters in an insulated nozzle with a velocity of 50 m/s. It leaves at a pressure of 1.37 bar and a velocity of 500 m/s. Determine the final enthalpy of steam. (5)

(b) A Carnot cycle operates between source and sink temperatures of 250° C and - 15° C. If the system receives 90 kJ from the source, find: (i) Efficiency of the system, (ii) The net work transfer, (iii) Heat rejected to sink (5)

P.T.O.

4.(a) Describe with a neat sketch the working of Lancashire boiler. (6)

(b)Discuss the various methods to express the boiler performance. (4)

PART-B

5. (a) Explain the concept of Supersaturation of steam in a nozzle with its effects. (5)

(b)Steam is expanded in a set of nozzles from 10 bar and 200° C to 5 bar. What type of nozzle is it. Neglecting the initial velocity, find minimum area of the nozzle required to allow a flow of 3 kg/s under the given conditions. Assume the expansion of steam to be isentropic. (5)

6. (a) Explain the Concept of Governing of steam turbine with diagram. (4)

(b) The velocity of steam exiting the nozzle of the impulse stage of a turbine is 400m/s. The blades operate close to maximum blading efficiency. The nozzle angle is 20°. Considering equiangular blades and neglecting blade friction, Calculate for a steam flow of 0.6 kg/s, the diagram power and diagram efficiency. (6)

7. (a) A primemover uses 15000 kg of steam per hour and develops 2450 kW. The steam is supplied at 30 bar and 350° C. The exhaust from the primemover is condensed at 725mm Hg when barometer records 755mm Hg. The condensate temperature from the condenser is 31° C and the rise of temperature of circulating water is from 8° C to 18° C. Determine:

(i). the quality of steam entering the condenser.

(ii). the quantity of circulating cooling water and ratio of cooling. (6)

(b) Explain the differences between Surface and Jet condenser. (4)

x-x-x