(DME 225)

B. Tech. DEGREE EXAMINATION, MAY - 2015

(Examination at the End of Second Year)

MECHANICAL ENGINEERING

Paper - V : Applied Thermodynamics

Time : 3 Hours **Maximum Marks : 75**

Answer question No.1 is compulsory ***(15)***

Answer ONE question from each unit ***(4 × 15 = 60)***

1) a) Define 'a boiler' and 'a steam generating unit?

b) What are the essentials of good steam boiler?

c) Write short notes on Moiller chart?

d) How are the steam turbines classified?

e) Define the following :

i) Refrigeration

ii) Refrigerating system

f) Define the following :

i) Actual C.O.P

ii) Theoritical C.O.P

iii) Relative C.O.P.

g) Define Air – conditioning?

UNIT - I

2) In a Rankine cycle, the steam at inlet to turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar, determine :

a) The pump work.

b) The turbine work

c) The Rankine efficiency

d) The condenser heat flow

e) The dryness at the end of expansion.

OR

3) Explain the working principle of Babcock & Wilcox boiler with neat sketch?

UNIT - II

4) Define the term 'steam Nozzle', Explain various types of nozzles? Define Critical pressure ratio for the nozzle of the steam turbine. Obtain analytically its value in terms of the index of expansion?

OR

5) A simple impulse turbine has one ring of moving blades running at 150m/s. The absolute velocity of steam at exist from the stage is 85 m/s at an angle of 80º from the tangential direction. Blade velocity co-efficient is 0.82 and the rate of steam following through the stage is 2.5 kg/s. If the blades are equiangular, determine :

a) Blade angles

b) Nozzle angle

c) Absolute velocity of steam issuing from the nozzle

d) Axial thrust

UNIT - III

6) A surface condenser is required to deal with 20000 kg of steam per hour, and the air leakage is estimated at 0.3 kg per 1000 kg of steam. The steam enters the condenser dry saturated at 38ºC. The condensate is extracted at the lowest point of the condenser at a temperature of 36ºC. The condensate loss is made up with water at 7ºC. It is required to find the saving in condensate and the saving in heat supplied in the boiler, by fitting a separate air extraction pump which draws the air over an air cooler. Assume that the air leaves the cooler at 27ºC. The pressure in the condenser can be assumed to remain constant and also calculate the percentage reduction in air pump capacity by using the separate extraction method?

OR

7) A Two-stage air-compressor consists of 3 cylinders having the same bore and stoke. The delivery prll is 7 bar and the free air delivery is 4.2 m^3/min. Air is drawn in at 1.013 bar. 15ºC and an intercooler cools the air to 38ºC. The index of compression is 1.3 for all three cylinders. Neglecting clearance calculate :

a) The Intermediate pressure.

b) The power required to drive the compressor.

c) The Isothermal efficiency.

UNIT - IV

8) A Bell-Coleman refrigerator operates between pressure limits of 1 Kgf/cm^2 and 8 Kgf/cm^2 abs. Air is drawn from the cold chamber at 9ºC, Compressed and then it is cooled to 29ºC before entering the expansion cylinder. Expansion and compression flow the law $PV^{1.35}$ = const. Calculate the theoritical C.O.P of the system.

OR

9) Atmosphere air at a pressure of 760 mm of Hg has a temperature of 32ºC and a percentage saturation as determined from a psychrometric chart of 52% calculate.

a) The partial pressure of the vapour and the dry air

b) The Specific humidity.

c) The dew point

d) The density of the mixture.

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