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Roll No .....

AU/ME-223

B.E., III Semester

Examination, December 2016

Choice Based Credit System (CBCS)

Thermodynamics

Time : Three Hours

Maximum Marks : 60

Note: i) Attempt any five questions.
ii) All questions carry equal marks.
iii) Use of Mollier chart and steam table allowed in side examination hall.

1. a) Define: Thermodynamic properties, Thermodynamic equilibrium, Thermodynamic process, State of the system.
   b) Differentiate clearly between Heat Engine, Heat pump and Refrigerator. Deduce their efficiency equations.

2. a) Prove equivalance of Clausius statement and Kelvin plank statement of II[nd] law of thermodynamics.
   b) With the help of mathematical analysis explain available and unavailable energy concepts.

3. Two kgs of steam at a pressure of 20 bar exists in the following conditions:
   a) Wet steam with a dryness fraction of 0.9
   b) Dry and saturated steam
   c) Superheated steam with temperature of 250°C
   Calculate (i) Enthalpy (ii) Volume (iii) Entropy (iv) internal energy in all above a, b and c cases. Assume C_p = 2.302 kJ/kg °K for superheated steam.

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4. a) Explain concept of sensible heat and latent heat of evaporation and fusion with the help of a temperature-Enthalpy curve and explain it.
   b) How dryness fraction is measured by separating throttling calorimeter, write down with the help of neat sketch.

5. A diesel engine operates on the air standard diesel cycle. The engine has 6 cylinders of 11cm bore and 13cm stroke. The engine runs at 2000rpm. At the beginning of compression of air it is at 1 bar and 26°C. If the clearance volume is 12.5% of the stroke volume find :
   a) Compression ratio
   b) Pressure and temperature of the air after compression
   c) Thermal efficiency and power output if the air is heated to 1370°C

6. A mixture of gases having 2kg of He and 5kg of N_2 at 30°C and 1 bar is compressed in a reversible adiabatic process to 6 bar. Find :
   a) The final partial pressure of the constituents
   b) The final temperature and
   c) Change in internal energy of the mixture during the process.
   Assume : $(C_v)_{N_2} = 0.744$, $(C_v)_{He} = 3.157$,
   $(C_p)_{N_2} = 1.049$, $(C_p)_{He} = 5.269$ kJ/kg K.

7. a) Discuss third law of Thermodynamics.
   b) Explain Enthalpy of formation.
   c) Discuss Adiabatic flame temperature.
   d) Discuss Enthalpy of reaction.

8. Write short notes on followings:
   a) Deduce air standard efficiency of a diesel cycle.
   b) Limitation of first law of Thermodynamics.
   c) Explain actual and theroretical combustion processes.
   d) Enlist five applications of Entropy.

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