Total No. of Questions : 8]

SEAT No. :

PE-4352

[Total No. of Pages : 3

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S.E. (Mechanical /Automobile & Mechanical) (Mechanical S.W.)

ENGINEERING THERMODYNAMICS

(2019 Pattern) (Semester - III) (202043)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) State and prove clausius Inequality? **[6]**

b) 5kg of ICE at -5^{0}C is exposed to atmosphere which is at 30^{0}C. The ice melts and then comes into thermal equilibrium with the surrounding determine entropy increase of the universe. **[6]**

c) Prove that entropy is the property of the system. **[5]**

OR

Q2) a) Explain **[6]**

i) Entropy

ii) Effectiveness

iii) Second law efficiency.

b) Different between unavailable and available energy. **[6]**

c) 30 kg of copper block, C_p=0.386 kJ/kgk at 95^{0}C is dropped in 30 liters of water at 24^{0}C. Assume perfect heat transfer and no heat lost to the surroundings. Find the final equilibrium temperature reached for water and copper block and entropy generation. **[5]**

Q3) a) Write short notes on following terms. **[6]**

i) Critical Point

ii) Enthalpy of Steam

iii) Triple Point

P.T.O.

b) Determine superheated entropy, enthalpy and specific volume for a steam at 20 bar and 250^{0}C using steam table. **[6]**

c) Draw and explain P-V Diagram for water. **[6]**

OR

Q4) a) Explain Separating and throttling calorimeter. **[6]**

b) Difference between Rankin cycle and Carnot cycle. **[6]**

c) Explain Carnot vapour power cycle with the help of T-S diagram. **[6]**

Q5) a) Write down the advantages and disadvantages of gaseous fuel. **[6]**

b) Explain Boys Gas Calorimeter with a schematic diagram. **[6]**

c) A Carnot vapour power cycle operaters between 20kpa and 800kpa steam pressures. Calculate net work per cycle and cycle efficiency. **[5]**

OR

Q6) a) Explain ORSAT Flue gas analysis. **[6]**

b) A Bomb calorimeter water used to determine the calorific value of a coal sample and the following reading where recorded **[6]**

Mass of coal sample = 1.01gm

Mass of water = 2.5kg

Water equivalent of apparatus = 744gm

Temperature of rise water = 2.59^{0}C

Temperature correction of cooling = +0.016^{0}c

Determine the calorific value of sample in kJ/kg

Take c_p for water 4.186kj/kg k.

c) Explain Equivalence ratio, Calorific value - HCV & LCV. **[5]**

Q7) a) Define Boiler and Classify The Boilers. **[6]**

b) How much air per kg of coal is burnt in a boiler having chimney height of 32.3m to create a drought of 19mm of water column when the temperature of the flue gases leaving chimney is 370^0C and temperature of boiler house is 29.5^0C. Also calculate the drought produced in terms of hot gas column. **[6]**

c) Explain the procedure to draw the heat balance sheet for a boiler plant. **[6]**

Q8) a) Explain Superheater and Economizer. **[6]**

b) A boiler evaporates 3.6 kg of water per kg of coal is saturated steam at 10 bar. The temperature of feed water is 32^0c. find the euivalent evaporation. From and at 100^0C as well as the factor of Evaporator. **[6]**

c) Explain functions and locations of different boiler mountings. **[6]**

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