Time: 3 Hours
01/06/18
Marks: 80

N.B.:
1. Question No.1 is compulsory and attempt any four questions from remaining
2. Assume data if necessary and specify the assumptions clearly
3. Draw neat sketches wherever required

Q.1 [Compulsory Question]   Marks [04X05=20]

a) Compare the energy scenario of India with any other developed countries with respect to per capita energy generation, consumption and Transmission & Distribution loss.
b) State the steps of energy audit.
c) Explain the concept of "optimum approach temperature difference (ΔTopt)" in heat exchanger networking.
d) Write down the advantages, disadvantages and application of Nuclear energy.

Q.2   Marks [02x10=20]

a) Explain how to make "motor, belts and drives system" of process plant more efficient
b) Explain in detail about concept and methodology of energy Audit.

Q.3   Marks [02x10=20]

a) A triple effect evaporator is concentrating a liquid that has no appreciable elevation in boiling point. The temperature of steam to the first effect is 108°C, and the boiling point of the solution in the last effect is 52°C. The overall heat transfer coefficients, in W/m2°K are 2500 in the first effect, 2000 in the second effect and 1500 in the third effect. At what temperatures will the liquid boil in the first and second effects?

b) Determine the pinch temperature and the minimum utility requirement for the stream set out in the table below for a minimum temperature difference between the streams of 20 °C.

Stream	T^s (K)	T' (K)	C (KW/K)
1	350	250	2
2	430	380	5
3	430	250	1
4	240	420	4

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Q.4
Marks [02×10=20]

a) Determine the pinch temperature and the minimum hot and cold utility requirement, number of heat exchanger and pinch temperature for given stream $\Delta T_{min} = 10°C$

Stream	Type	T^s (K)	T^t (K)	C (KW/K)
1	Hot	623	433	3.2
2	Hot	673	373	3.0
3	Hot	383	333	8.0
4	cold	323	523	4.5
5	cold	343	593	2.0
6	cold	373	573	3.0

b) The potential for electricity generation (PGC) for a steam turbine system is 18,500 kW. The saturated steam is being expanded through a PRV to obtain process steam

Determine:
I. Theoretical steam rate (TSR) in lb/kW-hr
II. Steam flow rate (Ws) in lb/hr

Data :
Inlet enthalpy of steam (hi)= 1378.9 Btu/lb
Outlet enthalpy of steam (ho)= 935.0 Btu/lb
Efficiency of turbine generator (ntg = 0.77)

Q.5
Marks [02×10=20]

a) State and Explain the gas turbine gas turbine cogeneration system also write down its advantages, disadvantages and application.

b) List out various techniques of Waste heat recovery and Explain any two technique in details

Q.6. Write Short Note on any four of the following
Marks [04×05=20]

a) Grant Composite Curve
b) Energy Profile
c) Pinch Technology
d) Global Energy Scenario