**Registration no:**

**2nd Sem Regular / Back Examination – 2015-16**
**HEAT EXCHANGER ANALYSIS & DESIGN**
**Q.CODE:W826**
**Time: 3 Hours**
**Max marks: 70**

**Answer Question No.1 which is compulsory and any five from the rest.**
**The figures in the right hand margin indicate marks.**

**Q1**    Answer the following questions:                                                                         (2 x 10)
  a)   Define fouling factor and the parameters affecting the resistance and heat transfer.
  b)   What are the factors affecting cooling tower performance.
  c)   What do you mean by hydraulic diameter and its effect on design of heat exchanger?
  d)   Differentiate between direct contact type and storage type heat exchanger.
  e)   When a heat exchanger is called as compact heat exchanger? Give an example.
  f)   What are the causes of pressure drop in shell and tube heat exchangers?
  g)   In a cross flow both fluids unmixed has water at $6^0$C flowing at 1.25 kg/s. It is to cool 1.2 kg/s of air that is initially at temperature of $50^0$C.Calculate NTU & heat capacity ratio. Assume U=130W/m$^2$K and area is 23m$^{2.}$
  h)   The extended surfaces are always used on gas side in liquid to gas heat exchange, justify your answer.
  i)   What is correction factor, where it is used?
  j)   Explain briefly Bell –Delaware method with neat sketch and its importance.

**Q2**  a)  What is the difference between rating & sizing of a heat exchanger?                                       (5)
     b)  What is fouling factor and how it affects the design of a heat exchanger in heat transfer and pressure drop?                                                                                          (5)

**Q3**  a)  What are the various noise sources in a heat exchanger, how it can be minimized.                         (5)
     b)  Briefly explain analysis of pressure drop is essential for heat exchanger thermal and mechanical analysis.                                                                                      (5)

**Q4**     A chemical having specific heat of 4.3 kJ/kg K at a rate of 30,000 kg/h enters a parallel    (10)
          Flow heat exchanger at $150^0$C.The flow rate of cooling water is 50,000 kg/h with an inlet temperature of $40^0$C.The heat transfer area is 20m$^2$ & overall heat transfer coefficient is 1070 W/m$^2$ K. Find effectiveness & outlet temperature of water & chemical. $C_p$ of water 4.187KJ/kg K.

**Q5**  a)  Classify heat exchanger according to flow and constriction type, Explain different    (6)
          characteristics.
     b)   Describe different types of baffles and its purpose of use.                                              (4)

**Q6** The effectiveness of the heat exchangers is independent of flow direction if one side fluid is undergoing a phase change. Prove it. (10)

**Q7** a) With a neat sketch, explain the working of a cooling tower, and its types. (4)

b) A hot fluid at $200^0$ C enters a heat exchanger at mass flow rate of $10^4$ kg/hr. The specific heat is 2000 J/kgK .It is to be cooled by other fluid entering at $25^0$ C with a mass flow rate 2500 kg/hr and specific heat 400 J/kgK. If U=250 W/m$^2$K based on outside area 20 m$^2$.Find the temperature of the hot fluids are in parallel flow. (6)

**Q8 Write short notes on any two** (5 x 2)
a) Effectiveness & Efficiency of Heat exchanger
b) Losses in cooling tower.
c) Regenerator and recuperator.