K L UNIVERSITY
IV/IV B.TECH. MECHANICAL ENGINEERING
II SEMESTER – 2012-13
TEST – II

COURSE TITLE: HEAT TRANSFER		COURSE CODE: 09ME 401
NAME OF THE COURSE COORDINATOR : Dr.K.RAMA KRISHNA		
DATE OF EXAM: 12.04.2013	MAX.MARKS : 40	DURATION: 90 MINUTES (10AM TO 11.30AM)

P A R T – A

Answer **ALL** questions. (6x2=12M)

1. How does the fouling factor affect the performance of a heat exchanger?
2. Why is it warmer in a glass house when compared to outside.
3. How do you minimize the error in temperature measurement by using a thermocouple, which occurs due to heavy radiation losses?
4. To reduce the heat loss from pipes carrying steam, in a power plant they are laid in horizontal position. Explain why?
5. Distinguish between specular and diffuse reflections.
6. A cube of side "a" is placed inside a hollow sphere of radius "2a" the outer surface of which is non-radiating. Find the shape factor of the sphere with itself.

P A R T – B

Answer any **TWO** questions. (2x14=28M)

7. (a) What is the significance of Colburn analogy and how will it be useful in convection problems. (4M)
   (b) A circular tube having a diameter 15cm and length 150cm carries air at 20^{o}C and flowing with an average velocity of 20 m/s. The tube is heated externally so that its surfaces are maintained at 160^{o}C temperature. Determine the amount of heat transferred from the tube surface to the air flowing inside it. (5M)
   (c) Calculate the rate of heat loss from a human body which may be considered as a vertical cylinder 30cm in diameter and 175cm high in still air at 15^{o}C. The skin temperature is 35^{o}C and emissivity at the skin surface is 0.4. Neglect sweating and effect of clothing. (5M)

8. (a) Derive the expression for LMTD of a counter flow heat exchanger. (6M)
   (b) Oil with a mean specific heat of 2.5 kJ/kg K is to be cooled from 110^{o}C to 30^{o}C in a single pass Counter flow heat exchanger. The coolant is water which enters at 20^{o}C and leaves at 80^{o}C and the overall heat transfer coefficient for this type of heat exchanger is 1.5 kW/m^{2} K. If the water flow rate is 1500 kg/hr, determine the quantity of oil that can be cooled per hour and the heat exchanger area (b) What would be the fluid exit temperatures when the water flow rate is decreased to1000 kg/hr for the same oil flow rate? Comment upon the results. (8M)

9. (a) Explain the concept of black body in radiation. (2M)
   (b) Distinguish between Real, Gray, Black & White bodies. (2M)
   (c) State the significance of Lamberts cosine law. (2M)
   (d) Find the % reduction in radiation heat transfer when a shield having emissivity 0.05 on both sides is placed between two large parallel hot plates having emissivity 0.7 and 0.8 and maintained at 1000K and 800K respectively. (8M)