

Roll No.

**KADI SARVA VIDYALAYA UNIVERSITY**  
**LDRP INSTITUTE OF TECHNOLOGY AND RESEARCH**

**B. E. Sem-V Mid Semester Examination**

**Subject Name: Heat & Mass Transfer**

**Time: 8:30 A.M to 10:00 A.M**

**Total Marks: 30**

**Date: 28-08-2014**

**Branch: Mechanical**

**Instructions:**

1. Make suitable assumption whenever necessary.
2. Figures to the right indicate full marks.

Q-1	State and explain (i) efficiency of fins (ii) effectiveness of fins	04
Q-2	With usual notations derive general heat conduction equation in Cartesian coordinates. OR Derive an expression for heat transfer for an infinite long Rectangular fin with insulated tip.	06
Q-3	Derive an expression for LMTD for counter flow heat exchanger. OR Derive the expression for effectiveness of parallel flow heat exchanger.	06
Q-4	A hot gas at 330°C with convection coefficient 222 W/m <sup>2</sup> K is following through a steel tube of outside diameter 8 cm and thickness 1.3 cm. It is covered with an insulating material of thickness 2 cm, having conductivity of 0.2 W/mK. The outer surface of insulation is exposed to ambient air at 25°C with convection coefficient of 55 W/m <sup>2</sup> K. Calculate: (1) Heat loss to air from 5 m long tube. (2) The temperature drop due to thermal resistance of the hot gases, steel tube, the insulation layer and the outside air. Take conductivity of steel = 50 W/m <sup>2</sup> K.	06
Q-5	A parallel flow heat exchanger has its tubes of 5 cm internal and 6 cm external diameter. The air flows inside the tubes and receives heat from hot gases circulated in the annular space of the tube at the rate of 100 kW. Inside and outside heat transfer coefficients are 250 W/m <sup>2</sup> K and 400 W/m <sup>2</sup> K respectively. Inlet temperature of hot gases is 500°C, outlet temperature of hot gases is 300°C, inlet temperature of air 50°C, Exit temperature of air 140°C. Calculate : (1) Overall heat transfer coefficient based on outer surface area (2) Length of the tube required to affect the heat transfer rates. Neglect the thermal resistance of the tube. (3) If each tube is 3 m length find the number of tubes required.	08

**BEST OF LUCK**