Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **B.TECH**
PCME4305

6th Semester Back Examination – 2017-18
HEAT TRANSFER
Branch: AERO, MECH, PLASTIC
Time: 3 Hours
Max marks: 70
Q. Code: C539

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1 **Answer the following questions:** **(2 x 10)**

a) What is fin? Give two example where fins are used.
b) What do you mean by view factor in radiation?
c) Name two example where all kind of heat transfer are experienced.
d) Differentiate between black body and gray body.
e) What do you mean by fin efficiency?
f) What is absorptivity of a body in radiative heat transfrer.
g) Differentiate hydrodynamic and thermal boundary layer thickness.
h) What is Reynolds number?
i) Classify heat exchanger according to the direction of fluid flow.
j) Why radiation shields are used?

Q2 **a)** Derive general steady state 3-D heat conduction equation in Cartesian coordinates. **(6)**

b) Define the following terms **(4)**
(i) Thermal diffusivity (ii) critical thickness of insulation.

Q3 A 3 m high and 5 m wide double-pane window consists of two 10 mm thick layers of glass (k=0.78W/mK) separated by a 30mm wide stagnant air gap (k=0.026W/mK). Determine the steady state heat transfer through this double-paned window and the temperature of its inner surface for a day during which room is maintained at 35°C while out door temperature is 10°C. Take the convection coefficients on the inner and outer surfaces are 12 and 22 W/m^2K respectively. Determine inside temperatures of all surfaces and overall heat coefficient also. **(10)**

Q4 A liquid (Cp=0.9 kJ/kg K) is entering a counter flow heat exchanger at 35°C at a rate of 4.5 kg/s. It is heated to 75°C by another fluid (Cp=1 kJ/kg K) with a flow rate of 2.5 kg/s entering at 900°C. With these things remaining same, what will be percentage change in the area of heat exchanger if the fluid is heated up to 600°C instead of 750°C? **(10)**

Q5 Two very large parallel planes with emissivities 0.8 and 0.5 exchange radiative energy. Determine the percentage reduction in radiative energy transfer when a polished aluminum radiation shield having 0.1 emissivity is placed between them. **(10)**

Q6 **a)** Explain the effect of extended surfaces on the heat transfer. **(3)**

b) Derive expressions for temperature distribution and heat dissipation in a straight fin of rectangular profile. Assume any one condition for the analysis. **(7)**

Q7 **a)** Name and explain briefly the various modes of heat transfer. **(4)**

b) Define the following terms **(6)**

(i) Rayleigh number (ii) Biot number (iii) Nusselt number

Q8 **Write short notes on (any two)** **(5+5)**

a) Pool boiling and Flow boiling

b) Natural convection and Forced convection

c) Kirchhoff's law