Q.P. Code: 16ME320 **R16**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year II Semester Supplementary Examinations Dec 2019

HEAT TRANSFER

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	a	Derive 3D generalized heat conduction equation in cartesian co-ordinates		**6M**
	b	A carbon steel plate 600 X 900 X25 mm is maintained at 310 ^{0}C air at 15 ^{0}C blows over the hot plate if convection heat transfer coefficient is 22W/m^2 ^{0}C and 250 W is lost by plate surface radiation. Calculate the inside plate temperature. Take thermal conductivity k= 45 W/m ^{0}C.		**6M**

OR

2	a	Distinguish between conduction, convection and radiation modes of heat transfer.		**6M**
	b	Aluminum fin of rectangular bar are attached to a wall with width 3mm and length 10mm, thickness 1mm ,k=200w/m k .The wall is maintained at 200^{0}C. find heat dissipation by convection into ambient air 40^{0}C, h=50 w/m^2 k.		**6M**

UNIT-II

3	a	Sketch various types of fins. Give examples of use of fins in various engineering applications.		**4M**
	b	A wall consists of three layers of 0.2 m concrete, 0.08 m of fiber glass insulation and 0.015 m gypsum board (0.04 W/m K). The convective heat transfer coefficients at inside and outside surfaces are 15 and 45 W/m^2 K respectively. The inside and outside surface temperatures are 25^{0}C and -10^{0}C respectively. Calculate the overall heat transfer coefficients for the wall and heat loss per unit area.		**8M**

OR

4	a	What is lumped system analysis? Derive the expression for it.		**6M**
	b	Define the overall heat transfer coefficient. Obtain the expression for composite cylinder.		**6M**

UNIT-III

5	a	What is convective heat transfer? Distinguish between free and forced convection.		**6M**
	b	Water at 20^{0}C was flow over a plate of uniform heat flux 9000 W/m^2. The flow velocity was 200 mm/s. The length of the plate was 1.3 m. Determine the temperature of the plate.		**6M**

OR

6	a	How does turbulent flow differ from laminar flow? For which flow is the heat transfer coefficient higher?		**6M**
	b	Air at 27^{o}C flow over a flat plate at a velocity of 2 m/s. The plate is heated over its entire length to a temperature of 60^{o}C. Calculate heat transfer for the first 20 cm of the plate.		**6M**

UNIT-IV

7	a	Distinguish between (i) Evaporation and Boiling (ii) Pool boiling and flow boiling.	6M
	b	A horizontal tube of outer diameter 20 mm is exposed to dry steam at 100^0C.The tube surface temperature is maintained at 84^0C by circulating water through it. Calculate the rate of formation of condensate per meter of the tube.	6M

OR

8	a	Write an expression for Effectiveness by NTU method.	4M
	b	The flow rates of hot and cold water streams running through a parallel flow heat exchanger are 0.2 kg/s and 0.5 kg/s respectively. The inlet temperatures on the hot and cold sides are 75^0C and 20^0C respectively. The exit temperature of hot water is 45^0C. If the individual heats transfer coefficients on both sides are 650W/m^2 0C. Calculate the area of heat exchanger.	8M

UNIT-V

9	a	What is Stefan Boltzmann Law? Explain the concept of total emissive power of a Black Body.	4M
	b	Two very large parallel plates with emissivity 0.5 exchange heat. Determine the percentage reduction in the heat transfer rate if a polished aluminum radiation shield of emissivity = 0.04 is placed in between the plates.	8M

OR

10	a	Define emissivity, absorptivity and reflectivity.	6M
	b	Two large parallel planes with emissivities 0.35 and 0.85 exchange heat by radiation. The planes are respectively 1073K and 773K. A radiation shield having the emissivity of 0.04 is placed between them. Find the percentage reduction in radiation heat exchange.	6M

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