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

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year II Semester Supplementary Examinations March-2021

HEAT TRANSFER

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1 **a** Write the Fourier rate equation for heat transfer by conduction. Give the physical significance of each term. **8M**

b Determine the study state heat transfer rate through wall, 5m long x 4m high x 0.25m thick, With its two faces maintained at uniform temperatures of 100^0C and 30^0C. The wall has thermal conductivity equal to 0.7 W/m-K. **4M**

OR

2 **a** Explain about modes of heat transfer with their governing laws. **7M**

b A furnace operates at 400^0 C and has 30 cm thick wall. The outer side temperature of the furnace wall is 55^0 C. The thermal conductivity of material 50 W/mK. Calculate: The rate of heat loss per unit area from the furnace wall. **5M**

UNIT-II

3 **a** Explain the concept of critical radius of insulation for a cylinder. **6M**

b Determine the study state heat transfer rate through wall, 5m long x 4m high x 0.25m thick, With its two faces maintained at uniform temperatures of 100^0C and 30^0C. The wall has thermal conductivity equal to 0.7 W/m-K. **6M**

OR

4 **a** Define the fin effectiveness and fin efficiency. **4M**

b Calculate the percentage increases in heat transfer associated with attaching Aluminum fins of rectangular profile to a plane wall. The fins are 58 mm long 0.46 mm thick, and are equally spaced at a distance of 4 mm (250 fins/m). The convection coefficient associated with bare wall is 41 W/m^2K, while that resulting from attachment of the fins is 32 W/m^2K. **8M**

UNIT-III

5 **a** Explain hydrodynamic and thermal boundary layer with reference to flow over flat plate. **9M**

b Define Nusselt number, Prandtl number. **3M**

OR

6 **a** Derive the expression for Reynolds number and how flows are determined by Reynolds number. **6M**

b A vertical cylinder 1.5m high and 180 mm in diameter is maintained at 100^0C in an atmosphere environment of 20^0C. Calculate heat loss by free convection from the surface of the cylinder. Assume properties of air at mean temperature as ρ = 1.06 kg/m3,ν = 18.97 x 10-6 m^2/s, Cp = 1.004 kJ/kg^{0}C and k = 0.1042kJ/mh^{0}C. **6M**

UNIT-IV

7	a	What is heat exchangers and how they are classified?	6M
	b	Water flows at a rate of 70 Kg/min through a double pipe counter flow heat exchanger. Water is heated form 50°C to 80°C by oil flowing through the tube. The specific heat of oil is 2KJ/Kg k. Oil enters at 115°C and leaves at 75°C . The overall heat transfer co efficient is 350W/m^2 K. Calculate the heat transfer area required.	6M

OR

8	a	Define boiling and explain the different regimes of boiling heat transfer.	8M
	b	What is the difference between drop wise condensation and film wise condensation?	4M

UNIT-V

9	a	State and explain Kirchhoff's identity.	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	Explain the radiation shields.	7M
	b	Calculate the net radiant heat exchange per m^2 area for the large parallel at 427°C and 27°C, emissivity = 0.4.	5M

*** **END** ***