O.P.Code: 23ME0319	R23	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech. III Year II Semester Regular Examinations April-2026

HEAT TRANSFER

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 70**

PART-A

(Answer all the Questions **10 x 2 = 20** Marks)

1	a	Define the Convective heat transfer coefficient.	CO1	L1	2M
	b	Define the Thermal conductivity	CO1	L1	2M
	c	State Newtons Law of cooling.	CO2	L1	2M
	d	Define Reynolds number.	CO2	L1	2M
	e	Define convective heat transfer coefficient.	CO3	L1	2M
	f	Define Grashof number.	CO3	L1	2M
	g	what is nucleate boiling?	CO5	L1	2M
	h	what is film condensation?	CO5	L1	2M
	i	State Kirchhoffs law of radiation.	CO6	L1	2M
	j	Define Schmidt number.	CO6	L1	2M

PART-B

(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2		A constant temperature difference of 1667^{O}C is maintained across the surface of a slab of 3.05 cm thick. Calculate the rate of heat transfer per unit area across the slab for each of the following cases. i) slab made of copper(k=380.7 W/mK) ii) slab made of aluminum(k=225.0 W/mK) iii) slab made of carbon(k=17.3 W/mK) iv) slab made of brick(k=0.865 W/mK) v) slab made of asbestos(k=0.173 W/mK)	CO1	L4	10M

OR

3		A steam pipe 10 cm internal diameter and 11 cm outer diameter is covered with an insulating substance) k=1 W/mK). The steam temperature and the ambient temperature are 200^{O}C & 20^{O}C resp. if the convective heat transfer coefficient between the insulating surface and air is 8W/mK. Find the critical radius of insulation.	CO1	L3	10M

UNIT-II

4	a	What is convective heat transfer? Distinguish between free and forced Convection.	CO2	L4	5M
	b	Derive the expression for Reynolds number and how flows are determined byReynolds number?	CO2	L3	5M

OR

5		In a straight tube of 60 mm diameter, water is flowing at a velocity of 12 m/s. The tube surface temperature is maintained at 70 ℃ and the following wateris heated from the inlet temperature 15 ℃ to an outlet temperature of 45 ℃. taking the physical properties of water at its mean bulk temperature, Calculate the following: i. The heat transfer coefficient from the tube surface to the water ii. The heat transferred iii. The length of the tube	CO2	L4	10M

UNIT-III

6		Air at 20 ℃ is flowing over a heated flat plate at 134 ℃ at a velocity of 3m/s.the plate is 2m long and 1.5m wide. Calculate the thick ness of hydro dynamic boundary layer and skin friction coefficient at 40cm from the leading edge of the plate. The kinematic viscosity of air at 20 ℃ may be taken as a5.06 x 10^{-6} m ^{2}/s.	CO3	L4	10M

OR

7		Assuming that a man can be represented by a cylinder 30cm in diameter and 1.7m high with a surface temperature of 30 ℃. calculate the heat loss while standing in a 40km/hr wind at 12 ℃.	CO3	L1	10M

UNIT-IV

8		Calculate the following for an industrial furnace in the form of black body and emitting radiation at 2500 ℃. i.Monochromatic emissive power at 1.2 μm length ii.Wave length at which the emission is maximum iii.Maximum emissive power iv.Total emissive power v.Total emissive power of the furnace if the assumed as a real surface with emissivity equal to 0.9.	CO5	L4	10M

OR

9	a	Distinguish between Boiling and Condensation.	CO5	L4	5M
	b	What is black body? How is differ from a gray body?	CO5	L1	5M

UNIT-V

10		Explain briefly the various regimes of saturated pool boiling with diagram.	CO6	L2	10M

OR

11	a	Deduce the correlation in boiling with proper expression.	CO6	L4	5M
	b	Discuss the different types of processes for condensation of vapours on a solid surface.	CO6	L2	5M

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