Q-

C.U.SHAH UNIVERSITY Summer Examination-2016

Subject Name: Automobile Heat Transfer

Subject Code: 4TE05AHT1			Bra	Branch: B.Tech(Auto)			
	Semeste	er: 5	Date: 21/04/2010	6 Tin	ne: 02:30 To 05:30	Marks: 70	
	Instructi (1) (2) (3) (4)	ons: Use of Progr Instructions Draw neat di Assume suita	ammable calculate written on main an agrams and figure able data if needed	or & any other ele aswer book are str as (if necessary) a l.	ectronic instrument is rictly to be obeyed. t right places.	prohibited.	
1		Attempt t	he following ques	tions:			(14)
	a)	Upto the cr A. Added i B. Added i C. Convec D. Heat fly	ritical radius of ins insulation will incr nsulation will decr tive heat loss will us will decrease	sulation, rease heat loss rease heat loss be less than cond	uctive heat loss		
	b)	Unit of the A. m ² /hr	ermal diffusivity is B. m ² /hr °C	C. kcal/m ² hr	D. kcal/m. hr	°C	
	c)	The rate of A. Stanton C. Biot nu	energy transferred number mber	d by convection t B. Nu D. Pe	o that by conduction i usselt number eclet number	s called	
	d)	Thermal co A. Moistur	onductivity of woo re B. Density	od depends on C. Temperatu	re D. All of the	above	
	e)	The unit of A. W/m ² K	f overall coefficien B. W/m ²	nt of heat transfer C. W/mK	is D. W/m		
	f)	LMTD in exchanger	case of counter flo is B Lower C	ow heat exchange	er as compared to par	allel flow heat	
	g)	The transfe	er of heat by molec B Liquids	cular collision is	smallest in	ese	
	h)	In heat ex temperatur A. Cold wa B. Hot mea C. Hot mea D. Hot mea	changers, degree res of dium inlet and outle dium outlet and co dium outlet and co	of approach is et let old water inlet old water outlet	defined as the differ	rence between	

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i)	In a shell and tube heat exchanger, baffles are provided on the shell side to			
	A. Improve heat transfer	B. Provide support for tubes		
	C. Prevent stagnation of shell side fluid	D. All of these		
j)	Joule sec is the unit of			
	A. Universal gas constant	B. Kinematic viscosity		
	C. Thermal conductivity	D. Planck's constant		
k)	Fourier's law of heat conduction gives the heat	at flow for		
	A. Irregular surfaces			
	B. Nonuniform temperature surfaces			
	C. One dimensional cases only			
	D. Two dimensional cases only			
l)	The value of Prandtl number for air is about			
	A. 0.1 B. 0.3 C. 0.7 D	. 1.7		
m)	The product of Reynolds number and Prandtl	number is known as		
	A. Stanton number	B. Biot number		
	C. Peclet number	D. Grashoff number		
n)	Heat transfer in liquid and gases takes place by			
	A. Conduction	B. Convection		
	C. Radiation	D. Conduction and convection		
Attempt any f	Cour questions from Q-2 to Q-8			

Q-2	2 Attempt all questions			
	Α	Explain the following terms:	4	
		1. Thermal diffusivity		
		2. Thermal conductivity		
	В	Explain the terms fin efficiency and fin effectiveness.	4	
	С	Derive general three dimensional heat conduction equations in cylindrical coordinate system without internal heart generation in anisotropic material with steady state.	6	
Q-3		Attempt all questions	(14)	
•	Α	Write down different types of cooling properties.	4	
	B	Define effectiveness and NTU of a heat exchanger.	4	
	С	Define absorptivity, reflectivity and transmissivity with respect to radiation heat transfer.	6	

Q-4 Attempt all questions

A What do you understand by critical radius of insulation? Draw rough sketch 7 showing variation in heat transfer with respect to radius of insulation. Derive the equation for critical radius of insulation for cylinder.

(14)

- **B** A stainless steel fin (k= 20 W/mK) having a diameter of 20 mm and a length of 0.1 m is attached to a wall at 300° C. The ambient temperature is 50 ° C and the heat transfer coefficient is $10 \text{ W/m}^2\text{K}$. The fin tip is insulated. Determine:
 - (a) The rate of heat dissipation from the fin,
 - (b) The temperature at the fin tip,

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(c) The rate of heat transfer from the wall area covered by the fin if the fin was not used.

Q-5		Attempt all questions	(14)
	Α	Explain Kirchhoff's law of radiation.	7
	B Steam at 350° C flowing in a pipe ($k = 80 \text{ W/mK}$) 5 cm I.D., 5.6 c		7
		covered with 3 cm thick insulation (k 0.05 W/mK). Heat is lost to the	
		surroundings at 5 ° C by natural convection and radiation with combined h= 20	
		W/m^2K and $h_i = 60 W/m^2K$.	
		To find: (i) The rate of heat loss from the pipe per unit length,	
		(ii) The temperature drops across the pipe and the insulation.	
Q-6		Attempt all questions	(14)
	Α	What are the two modes in which condensation can take place on a cooling	4
		surface? What is film Condensation?	
	B	What is a shell and tube type heat exchanger? Why are baffles used?	4
	С	Derive expression for Radiation Heat exchange between two concentric infinite long grey cylinders.	6
Q-7		Attempt all questions	(14)
	Α	Derive momentum equation for hydrodynamic boundary layer over a flat plate.	6
	B	Derive an expression for the temperature distribution and heat dissipation from a	6
	C	In insulated at the tip.	2
	C	what is black body? How does it differ from gray body? Give examples of each.	2
Q-8		Attempt all questions	(14)
	Α	State Buckingham's Π Theorem. Derive the relation between Nusselt No.,	6
		Prandtl no. and Reynolds no. for forced convection using theorem.	
	В	Write shortnote on "Thermostat valve".	6
	С	Define Heat exchanger. Give classification of Heat exchanger.	2



