	2	10	210	210	210	210	210	210
	Re	gistratio	n No :					
Tota	al Ni	umber of	Pages : 02				B.T PME5	ech 1102
		10		HEAT BRAN Time Max I Q.CC	/ Back Examina TRANSFER CH : MECH 9 : 3 Hours Marks : 100 DDE : E397		210	21(
An			on No.1 (Part-	•	mpulsory, any n Part-III,	EIGHT from Pa	-	
	2	10	The figure	es in the right	hand margin in	dicate marks.	210	210
Q1	a) b)	Give an e Ice is a b	example where lack body. Just	estions (Answe all three modes	Part- I er All-10) of heat transfer a	re predominant.	(2 x	10)
	f)	What is t What do What are flat plate	hermal resistan you mean by th the generally a b) flow in a tube	ce? ermal boundary accepted values e?	of critical Reynol	210 Ids number for a)	210 flow over a	210
	i)	What do Draw the vertical p	you mean by su e laminar and t late.	ubcooled boiling urbulent velocit		for natural conve		
	2	10	210	=	210 Part- II	210	210	21
Q2	a)	What is on having the Two diffe	overall heat trar bree different m	r Type Question nsfer coefficient? aterials of three	ns- (Answer Any Deduce express different thicknes	Fight out of Twe tion for this in com is and thermal cor ssing over two out	nposite wall nductivities.	x 8)
	c) ²	Deduce f A 0.8 m glass(k= Determin surface, convectio W/m2K r	the expression f high and 1.5 m 78W/m K) sepa the the rate of f when the room on coefficient or espectively. Fin	wide double-par trated by a 10 r neat transfer thr is maintained at in the inside and d the overall hea	ne window consist nm wide stagnan ough this window 20°C and the out out side surfaces at transfer coefficie	n cylindrical pipe. ts of two 4 mm thia t air space (k=0.0 w and temperatur t side air is at -10° of the window as ent. nvection and free	26 Ŵ/mK). e of inside C. take the a 10 and 40	210
	e) 2	were fou	ental results for		er a flat plate with ssion of the form	n an extremely rou	ugh surface	210
		leading of	edge of the pla coefficient betwo	ate. Obtain an	expression for th	position x measure e ratio of the avo on x to the local he	erage heat	

	21	0	210	210	210	210	210	210
	g) ₂₁ h) ²¹ i) j) k)	with atmosph boundary laye length? At wh Reynolds nun Draw the boili Differntiate be Explain about What is radia parallel plates Define fin effe	eric air at 25°C. er behavior up to nat distance from ober is 5×105? ng curve and exp tween LMTD an Kirchhoff's law, tion shield? Mer and shield betw octiveness. How i	If one wishes to be Reynolds numb in the leading edg blain the different d NTU method Planck's law, Wei ntion the formula een two concentri s it different from	use the wind tur ers of 108, what he would transition portions in it. n's law and Stefa for this in case ic cylinders. fin efficiency?	an Boltzman law	plate plate critical	210
	0.4	0	040	Part-III	040	040	010	04.0
Q3	21	Derive the 3-I and deduce	D steady state get the expressions	eneral heat condu- for temperature	ction equation in distribution and	Cartesian coordi	inates (16)	210
Q4	21	suddenly imm coefficient is so of 1000C.Ass	nersed in a lic 50W/m²K.Determ sume the densit	quid at 1200C fo nine the time requ ry ² of steel 7800k	r which the con ired for the rod t	nvective heat tra	ansfer rature	210
		Derive the for	mulae used to so	olve the above pro	blem.			
Q5					-	what is $\Delta T Im ca$	alled? (16)	
	21	2.5 kg/s. It is entering at 1	heated to 75°C I 000°C. With the	by another fluid (Cese things remain	Cp=1 kJ/kg K) wi ining same, wh	th a flow rate of 2 at will be perce	2 kg/s ntage	210
Q6		surface 2 at 1 0.8 and surfa	000 K, and surface 2 is black. D	ace 3 is insulated. etermine the rate	Further, surface at which energ	1 has an emissiv	vity of	210
	21	0	210	210	210	210	210	210
	Q4 Q5	f) (k) (j) (k) (j) (k) (j) (k) (j) (k) (j) (k) (j) (k) (j) (k) (j) (k) (k) (k) (k) (k) (k) (k) (k) (k) (k	 with atmospheboundary layer length? At with Reynolds num g) Draw the boilin h)²¹ Differntiate bein i) Explain about j) What is radia parallel plates k) Define fin efferentiate bein efferentiate bein efferentiate bein efferentiate bein efferentiate bein bifferentiate bein efferentiate bein	 f) A fan that can provide air speed with atmospheric air at 25°C. boundary layer behavior up to length? At what distance from Reynolds number is 5×105? g) Draw the boiling curve and exp h) Differntiate between LMTD and Explain about Kirchhoff's law, j) What is radiation shield? Mer parallel plates and shield betw k) Define fin effectiveness. How ii b) Differentiate between Film wis ²¹Long Answer Type Question Derive the 3-D steady state ge and deduce the expressions straight fin of circular profile for Q4 A stainless steel rod of outer suddenly immersed in a lid coefficient is 50W/m²K.Determ²¹ of 1000C.Assume the densit thermal conductivity 40W/mK. Derive the formulae used to so In the heat transfer relation C Derive the expression for para ²¹A liquid (Cp=0.8 kJ/kg K) is en 2.5 kg/s. It is heated to 75°C f entering at 1000°C. With the change in the area of heat e 750°C? Q6 A long duct of equilateral trian surface 2 at 1000 K, and surface 2 to maintain these op 	 f) A fan that can provide air speeds up to 50 m/s is with atmospheric air at 25°C. If one wishes to boundary layer behavior up to Reynolds numblength? At what distance from the leading edg Reynolds number is 5×105? g) Draw the boiling curve and explain the different harmonic boundary layer behavior up to Reynolds number is 5×105? g) Draw the boiling curve and explain the different harmonic boundary layer behavior up to Reynolds number is 5×105? g) Draw the boiling curve and explain the different harmonic biffernitate between LMTD and NTU method i) Explain about Kirchhoff's law, Planck's law, Wei j) What is radiation shield? Mention the formula parallel plates and shield between two concentric k) Define fin effectiveness. How is it different from i) Differentiate between Film wise and drop wise of Derive the 3-D steady state general heat condu and deduce the expressions for temperature straight fin of circular profile for the infinitely lon Q4 A stainless steel rod of outer diameter 1cm of suddenly immersed in a liquid at 1200C for coefficient is 50W/m²K.Determine the time requiled for 1000C.Assume the density of steel 7800 thermal conductivity 40W/mK. Derive the formulae used to solve the above procomplex the expression for parallel flow heat exch Q1 A liquid (Cp=0.8 kJ/kg K) is entering a counter fl 2.5 kg/s. It is heated to 75°C by another fluid (Centering at 1000°C. With these things remain change in the area of heat exchanger if the f 750°C? Q6 A long duct of equilateral triangle section of sid surface 2 at 1000 K, and surface 2 is black. Determine the remain surface 2 to maintain these operating conditions 	 f) A fan that can provide air speeds up to 50 m/s is to be used in a with atmospheric air at 25°C. If one wishes to use the wind tur boundary layer behavior up to Reynolds numbers of 108, what length? At what distance from the leading edge would transition Reynolds number is 5×105? g) Draw the boiling curve and explain the different portions in it. h) Differnitate between LMTD and NTU method i) Explain about Kirchhoff's law, Planck's law, Wein's law and Stefe i) What is radiation shield? Mention the formula for this in case parallel plates and shield between two concentric cylinders. k) Define fin effectiveness. How is it different from fin efficiency? i) Differentiate between Film wise and drop wise condensation. Part-II ²¹ Long Answer Type Questions (Answer Any Two out of Four). Derive the 3-D steady state general heat conduction equation in and deduce the expressions for temperature distribution and straight fin of circular profile for the infinitely long fin case. Q4 A stainless steel rod of outer diameter 1cm originally at a ten suddenly immersed in a liquid at 1200C for which the cordico coefficient is 50W/m²K.Determine the time required for the rod to of of 0100C.Assume the density of steel 7800kg/m3,Specific h thermal conductivity 40W/mK. Derive the formulae used to solve the above problem. Q5 In the heat transfer relation Q=UAΔTIm for a heat exchanger, Derive the expression for parallel flow heat exchanger. ²⁰ A liquid (Cp=0.8 kJ/kg K) is entering a counter flow heat exchanger, Derive the area of heat exchanger if the fluid is heated up 750°C? Q6 A long duct of equilateral triangle section of side w=0.75 m has surface 2 at 1000 K, and surface 3 is insulated. Further, surface 2 to maintain these operating conditions. 	 A fan that can provide air speeds up to 50 m/s is to be used in a low speed wind t with atmospheric air at 25°C. If one wishes to use the wind tunnel to study flat boundary layer behavior up to Reynolds numbers of 108, what is the minimum length? At what distance from the leading edge would transition occur, if the C Reynolds number is 5×105? D Draw the boiling curve and explain the different portions in it. D'Ifferntiate between LMTD and NTU method What is radiation shield? Mention the formula for this in case of shield betwee parallel plates and shield between two concentric cylinders. Define fin effectiveness. How is it different from fin efficiency? D'Ifferentiate between Film wise and drop wise condensation. Part-III Long Answer Type Questions (Answer Any Two out of Four) ²¹⁰ Derive the 3-D steady state general heat conduction equation in Cartesian coordinand deduce the expressions for temperature distribution and heat dissipation straight fin of circular profile for the infinitely long fin case. A stainless steel rod of outer diameter 1cm originally at a temperature of 300 suddenly immersed in a liquid at 1200C for which the convective heat thr coefficient is 50W/m²K. Determine the time required for the rod to reach a temper ²¹ of 1000C. Assume the density of steel 7800kg/m3. Specific heat as 450J/kg/ thermal conductivity 40W/mK. Derive the formulae used to solve the above problem. A liquid (Cp=0.8 kJ/kg K) is entering a counter flow heat exchanger, what is ΔTIm car 2.5 kg/s. It is heated to 75°C by another fluid (Cp=1 kJ/kg K) with a flow rate of 300 entering at 1000°C. With these things remaining same, what will be perce change in the area of heat exchanger if the fluid is heated up to 600°C inste 750°C? A long duct of equilateral triangle section of side w=0.75 m has its surface 1 at 7 surface 2 to maintain these operating conditions. 	 f) A fan that can provide air speeds up to 50 m/s is to be used in a low speed wind tunnel with atmospheric air at 25°C. If one wishes to use the wind tunnel to study flat plate boundary layer behavior up to Reynolds numbers of 108, what is the minimum plate length? At what distance from the leading edge would transition occur, if the critical Reynolds number is 5×105? g) Draw the boiling curve and explain the different portions in it. 20 20 g) Draw the boiling curve and explain the different portions in it. 20 20 g) Draw the boiling curve and explain the different portions in it. 20 20 g) Draw the boiling curve and explain the different gortions in it. 20 20 g) Draw the boiling curve and explain the different gortions in it. 20 20 g) Draw the boiling curve and explain the different gortions in it. 20 20 g) Draw the boiling curve and explain the different gortions in it. 20 20 g) Draw the boiling curve and explain the different gortions in a low speed wind tunnel with a bout Kirchhoff's law, Planck's law, Wein's law and Stefan Boltzman law j) What is radiation shield? Mention the formula for this in case of shield between two parallel plates and shield between two concentric cylinders. k) Define fin effectiveness. How is it different from fine efficiency? j) Differentiate between Film wise and drop wise condensation. PartII ²¹ Long Answer Type Questions (Answer Any Twö out of Foury)²¹⁰ 210 Derive the 3-D steady state general heat conduction equation in Cartesian coordinates and deduce the expressions for temperature distribution and heat dissipation in a straight fin of circular profile for the infinitely long fin case. Q4 A stainless steel rod of outer diameter from originally at a temperature 0300C is suddenly immersed in a liquid at 1200C for which the convective heat transfer coefficient is 50V/m³K. Determine the time required for the rod to reach a tempera

210 210 210 210 210 210 210 210 21

210 210 210 210 210 210 210 2