

**INSTITUTE OF AERONAUTICAL ENGINEERING** 

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## **AERONAUTICAL ENGINEERING**

## **DEFINITIONS AND TERMINOLOGY**

Course Name	:	HEAT TRANSFER
Course Code	:	AAE515
Program	:	B.Tech
Semester	:	V
Branch	:	AERONAUTICAL ENGINEERING
Section	:	A/B
Academic Year	:	2019–2020
Course Faculty	:	Dr. P Srinivasa Rao, Professor

## **OBJECTIVES:**

Ι	To help students to consider in depth the terminology and nomenclature used in the syllabus.
II	To focus on the meaning of new words / terminology/nomenclature

## **DEFINITIONS AND TERMINOLOGYQUESTION BANK**

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		UNIT	`– I			
1	What is Heat transfer?	Transmission of energy from one region to another as a result of "Temperature Gradient"	Understand	CO1	CLO.01	AAE515.01
2	What is Heat?	The energy in transit is termed as "Heat" represented by "Q"	Understand	CO1	CLO.01	AAE515.01
3	What are the Modes of Heat Transfer?	<ul><li>(1) Conduction</li><li>(2) Convection</li><li>(3) Radiation</li></ul>	Remember	CO1	CLO.01	AAE515.01
4	Define Conduction?	Transfer of Heat from one part of a substance to another part of the substance (or) from one substance to another in physical contact whit it, with appreciable displacement of the substance.	Understand	CO1	CLO.02	AAE515.02
5	Define a Fourier's Law of Conduction?	The rate of flow of heat through a simple homogeneous solid is directly proportional to the area measured normal to the direction of heat flow and to the temperature gradient in that direction $Q = -A dT/dx$ ; Where, A is Area in m <sup>2</sup> . $dT/dx - Temperature gradient$ , K/m; k –	Understand	COI	CLO.02	AAE515.02

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		Thermal conductivity, W/mK.				
6	Define	Thermal conductivity is defined	Understand	CO1	CLO.02	AAE515.02
	Thermal	as the ability of a substance to				
	conductivity?	conduct heat. Represented by				
	5	"K":Units: W/mK				
7	What are	a. Moisture	Remember	CO1	CLO.03	AAE515.03
	factors	b. Density of material				
	affecting the	c. Pressure				
	Thermal	d. Temperature				
	Conductivity	e. Structure of material				
8	What is	It is fluid motion is produced due	Remember	CO1	CLO.03	AAE515.03
	meant by	to change in density resulting				
	Natural	from temperature gradients, the	-		-	
	Convection	mode of heat transfer is said to be				
	and Forced	free or natural convection.				
	Convection?	If the Fluid motion is artificially				
		created by means of an external				
		agency like blower or Fan, the				
		heat transfer is termed as Forced				
		Convection.				
		$\mathbf{Q} = \mathbf{h}\mathbf{A}(\mathbf{T}_{s}-\mathbf{T}_{f})$				
		Where Q is Rate of Heat Transfer				
		<b>h</b> – Heat Transfer Coefficient				
		$(W/m^2K)$ .				
		<b>T</b> <sub>s</sub> – Fluid Temperature				
		T <sub>f</sub> – Surface Temperature				
9	What is	The rate equation for the	Understand	CO1	CLO.02	AAE515.02
	Newton's	convective heat transfer between				
	Law of	a surface and adjacent fluid is				
	Cooling?	prescribed by Newton's Law of				
		Cooling				
10	Define	Radiation is the transfer of heat	Understand	CO1	CLO.02	AAE515.02
	Radiation	through space or matter by means		_	<b>1</b>	
	0	other than conduction or		-	· · ·	
		convection				
		Radiation is an Electromagnetic				
		Wave Phenomenon, It depends				
		only on the Temperature and on			1000	
		the optical properties of the			A 10	
		emitter			Sec. 1	
		$\mathbf{Q} = \mathbf{F} \boldsymbol{\sigma} \mathbf{A} \boldsymbol{\in} (\mathbf{T}_1^4 - \mathbf{T}_2^4)$		- C		
		Where $\sigma'$ is Stefan-Boltzmann		0.1	r	
		Constant		· · ·		
		€: emissivity	0 1			
11		F: View Factor		<b>GO1</b>		A A T E 1 E 00
11	Denne	It is defined as the total radiant	Understand	COI	CL0.02	AAE515.02
	Stefan-	heat energy emitted from a				
	BOILZMANN	surface is proportional to the				
	law?	temperature $\Omega \propto T^4$				
12	Dofine	Emissivity is defined as the set	Understand	COL	CLOD	A A E 5 1 5 0 2
12	Emicoivit-2	of amissive neuror of anthody to	Understand	COI	CL0.02	AAEJ13.02
	Emissivity?	the amissive power of anybody to				
		blackbody For many bed				
		emissivity varies between 0 to 1				
		& for black body amissivity is 1				
12	Define a	A black surface is defined by	Understand	CO1		AAE515.02
13	black surface	three criteria:	Understählu	001	CL0.02	AAEJ13.02
	orack surface	it absorbs all radiation that is				
		<ul> <li>It absorbs all radiation that is</li> </ul>				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	СО	CLO	CLO Code
		incident on it				
		• it emits the maximum energy				
		possible for a given				
		temperature and wavelength				
		of radiation (according to				
		Planck's law)				
		• the radiation emitted by a				
		blackbody is not directional				
		(it is a diffuse emitter)				
		A black surface is the perfect				
		emitter and absorber of radiation.				
		It is an idealized concept (no				
		surface is exactly a black				
		surface), and the characteristics of			-	
		real surfaces are compared to that				
		of an ideal black surface.				
14	What is	A steady process is one which is	Remember	CO1	CLO.03	AAE515.03
	Steady State	not depend on time, that is, the				
	process?	rate of heat transfer does not vary				
		with time.				
15	What is	If the temperature varies only in	Remember	CO1	CLO.03	AAE515.03
	meant by	the x-direction, then the				
	One –	Laplacian operator takes the form				
	Dimensional	$d^2 \Gamma/dx^2$ in all directions				
	Heat					
1.6	Conduction?	The gap and three dimensional	D 1	001		
16	three	heat conduction equation in	Remember	COI	CLO.03	AAE515.03
	dimensional	near conduction equation in				
	heat	$\partial^2 T$ , $\partial^2 T$ , $\partial^2 T$ , $\dot{q} = 1$ $\partial T$				
	conduction	$\frac{\partial x^2}{\partial x^2} + \frac{\partial y^2}{\partial y^2} + \frac{\partial z^2}{\partial z^2} + \frac{\partial z}{\partial x} = \frac{\partial \tau}{\partial \tau}$				
	equation in	Cartesian coordinate is			100	
	Cartesian					
17	Write the	The general three dimensional	Remember	CO1	CLO 03	AAE515.03
17	three	heat conduction equation in	remember	001	010.05	1111111111111111
	dimensional	cylindrical coordinates is				
	heat	1 2 / 2011 1 2 / 2011 2 / 2011 201				
	conduction	$\frac{10}{10} k^{-01} + \frac{10}{10} k^{-01} + \frac{10}{10} k^{-01} + \frac{10}{10} k^{-01} + \alpha = \alpha^{-01}$			_	
	equation in	τ6 <sup>**</sup> (¤6 ̈)¤6 ̈ (Φ6 ̈)Φ6 <sup>°</sup> r ( τ6 ¨) π6 τ		/	10 million	
	cylindrical				- ×	
	coordinates				Q~	
18	What is	The physical significance of	Understand	CO1	CLO.02	AAE515.02
	meant by	thermal diffusivity is that it tells		0.1	(°	
	Thermal	us how fast heat is propagated or		$\sim$		
	Diffusivity?	it diffuses through a material	2	100		
		during changes of temperature				
		With time.				
		diffusivity the shortest is the				
		time required for the applied heat				
		to percent deeper into the solid				
19	What is	The set equations derived so far	Understand	CO1	CLO 02	AAE515.02
17	meant by	describe a whole class of	Chicorstand	201	0.02	1111101010.02
	initial and	conduction phenomena in the				
	boundary	most general form. The				
	conditions	temperature distribution in a				
		medium of given form and size				
		can be determined by solving an				
		appropriated equation are called				
		boundary conditions				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		UNIT	– II			
1	Define overall heat transfer coefficient.	The overall heat transfer coefficient is defined in terms of the total thermal resistance between two fluids. If there are a number of thermal resistances between the two fluids, the overall heat transfer coefficient is given by: $U = 1/\sum R$ R is the Total Thermal Resistanct	Understand	CO2	CLO.04	AAE515.04
2	What is critical radius of insulation or critical thickness?	Addition of insulating material on a surface does not reduce the amount of heat transfer rate always. In fact under certain circumstances it actually increases the heat loss up to certain thickness of insulation. The radius of insulation for which the heat transfer is maximum is called critical radius of insulation, and the corresponding thickness is called critical thickness. $R_c = k/h$	Understand	CO2	CLO.07	AAE515.07
3	What is the effect of change in outer radius of the hollow cylinder on the thermal resistance of conduction?	the thermal resistance of conduction increases with increase in outer radius of the hollow cylinder	Understand	CO2	CLO.07	AAE515.07
4	Define fins or Extended surfaces.	Heat transfer by convection between a surface and fluid surroundings it can be increased by attaching to the surface thin strips of metals called fins. The surfaces used for increasing heat transfer are also called as extended surfaces	Understand	CO2	CLO.07	AAE515.07
5	Define Fin efficiency and effectiveness	The efficiency of a fin is defined as the ratio of actual heat transferred to the maximum possible heat transferred by the fin $\eta_{fin} = Q_{fin}/Q_{max}$ Fin effectiveness is the ratio of heat transfer with fin to that without fin	Understand	CO2	CLO.07	AAE515.07
6	What are theCommon applications of finned surfaces	<ul> <li>(i) Electrical motors</li> <li>(ii) Economizers for steam power plant</li> <li>(iii) Convectors for steam and cold water heating systems</li> <li>(iv) Cooling coils</li> </ul>	Remember	CO2	CLO.06	AAE515.06

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	СО	CLO	CLO Code
7	What is	When there is a change in	Understand	CO2	CLO.05	AAE515.05
	meant by	temperature of the body with				
	Transient	time then it is said to transient or				
	heat	unsteady state				
	conduction					
	or unsteady					
	state					
	conduction?					
8	Explain the	Biot number and Fourier number	Understand	CO2	CLO.08	AAE515.08
	significance	are two dimensionless number				
	of Fourier	used in transient heat transfer.				
	Number	They are mainly used in transient				
		heat transfer, where you want to			200	
		find the time of cooling/heating				
		of the object from a temperature				
		to ambient temperature It is				
		defined as the ratio of				
		characteristic body dimensions to				
		the temperature wave penetration				
		depth in time.			<i>a</i>	<del>.</del>
9	What is	In periodic heat flow, the	Understand	CO2	CLO.05	AAE515.05
	Periodic heat	temperature varies on a regular				
10	flow?	Dasis		000	CT O OC	
10	What are	A group of curves are used with	Remember	CO <sub>2</sub>	CLO.06	AAE515.06
	Heisler	unsteady-state case when Biot no.				
	charts?	is greater than 0.1. The most				
		cases that to be treated are 1-				
		Infinite plate (plate where				
		unickness is very small in				
		2 Infinite cylinder (where the				
		diameter is very small compared			Contract of Contra	
		to length) 3 Sphere				
11	What is	In a Newtonian heating or	Understand	CO2	CL O 04	AAE515.04
**	meant by	cooling process the temperature	enderstand	002	CLO.01	11111313.01
	Lumped heat	throughout the solid is considered				
	analysis?	to be uniform at a given time.				
		Such an analysis is called lumped			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
		heat capacity analysis		/		
12	What is	Periodic heat flow through	Understand	CO2	CLO.05	AAE515.05
	meant by	building section is practically			0	
	periodic heat	being used for air-conditioning		C		
	flow?	applications. An effort has been		0.7	1	
		made to combine the non-	1.1	0		
		periodic transient heat flow due	0			
		to instantaneous rise in outdoor	P			
		temperature with periodic heat				
		flow				
13	What is	A solid which extends itself	Understand	CO2	CLO.04	AAE016.04
	meant by	infinitely in all directions of				
	infinite	space is known as infinite solid.				
	solid?	In infinite solids, the Biot				
		number value is between 0.1 and				
1.4	XX71		TT. 1 · ·	000		
14	what is	A semi-infinite solid is an	Understand	002	CL0.04	AAE515.04
	Somi infinito	nueanzeu body that has a single				
	solide?	infinity in all directions				
	301103 :	In a semi-infinite solid at any				
		instant of time there is always a				
		mount of third, afore is always a	1		1	

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
	<b>`</b>	point where the effect of heating				
		or cooling at one of its				
		boundaries is not felt at all. At				
		this point the temperature				
		remains unchanged. In semi-				
		infinite solids, the Biot number				
		value is $\infty$				
15	Define Biot	The ratio of the conductive heat	Remember	CO2	CLO.08	AAE515.08
	Number.	resistance within the object to the				
		convective heat transfer				
		resistance across the object's				
		boundary The Biot number is				
		given by:				
		Bi = hL/k		100		
		Where $h = convective heat$				
		transfer coefficient, $k =$ thermal	· · · · ·			
		conductivity				
		L = characteristic length.				
16	What is the	Biot number is used to find	Remember	CO2	CLO.08	AAE515.08
	significance	Lumped heat analysis, Semi				
	o fBiot	infinite solids and infinite solids				
	number	If Bi< 0.1 Lumped heat analysis.				
		$B_1 = 0.1 < B_1 < 10\ 025.$				
		UNIT	- III			
1	What is	Dimensional Analysis (also	Understand	CO3	<b>CLO</b> .10	AAE515.10
	dimensional	called Factor-Label Method or				
	analysis?	the Unit Factor Method) is a				
		problem-solving method that uses				
		the fact that any number or				
		expression can be multiplied by			1	1. T.
		one without changing its value. It				
-		is a useful technique.				
2	How is	Dimensional Analysis is a	Understand	CO3	CLO.10	AAE515.10
	dimensional	problem-solving method that uses				
	analysis used	the fact that any number or				
	to solve	1 1/2 1/ 11				
	machlama?	expression can be multiplied by		1	~	
1	problems?	expression can be multiplied by one without changing its value. It			2	
	problems?	expression can be multiplied by one without changing its value. It is a useful technique.	The desired on d	602	CL O 10	A A E 515 10
3	problems? Why is	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical pattern of the	Understand	CO3	CLO.10	AAE515.10
3	problems? Why is dimensional	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only shout	Understand	CO3	CLO.10	AAE515.10
3	why is dimensional analysis important?	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical	Understand	CO3	CLO.10	AAE515.10
3	problems? Why is dimensional analysis important?	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the	Understand	CO3	CLO.10	AAE515.10
3	problems? Why is dimensional analysis important?	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful	Understand	CO3	CLO.10	AAE515.10
3	problems? Why is dimensional analysis important?	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker	Understand	CO3	CLO.10	AAE515.10
3	problems? Why is dimensional analysis important?	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too	Understand	CO3	CLO.10	AAE515.10
3	problems? Why is dimensional analysis important?	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If	Understand	CO3	CLO.10	AAE515.10
3	problems? Why is dimensional analysis important? State Buckingham	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a	Understand	CO3	CLO.10 CLO.09	AAE515.10 AAE515.09
3	problems? Why is dimensional analysis important? State Buckingham Pi Theorem	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a dimensionally homogeneous	Understand	CO3	CLO.10 CLO.09	AAE515.10 AAE515.09
3	problems? Why is dimensional analysis important? State Buckingham Pi Theorem	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a dimensionally homogeneous equation and if these contain m	Understand	CO3 CO3	CLO.10 CLO.09	AAE515.10 AAE515.09
3	problems? Why is dimensional analysis important? State Buckingham Pi Theorem	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a dimensionally homogeneous equation and if these contain m fundamental dimensions. then the	Understand	CO3	CLO.10 CLO.09	AAE515.10 AAE515.09
3	problems? Why is dimensional analysis important? State Buckingham Pi Theorem	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a dimensionally homogeneous equation and if these contain m fundamental dimensions, then the variables are arranged in to (n-m)	Understand	CO3	CLO.10 CLO.09	AAE515.10 AAE515.09
3	problems? Why is dimensional analysis important? State Buckingham Pi Theorem	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a dimensionally homogeneous equation and if these contain m fundamental dimensions, then the variables are arranged in to (n-m) dimensionless terms. These	Understand	CO3	CLO.10 CLO.09	AAE515.10 AAE515.09
3	problems? Why is dimensional analysis important? State Buckingham Pi Theorem	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a dimensionally homogeneous equation and if these contain m fundamental dimensions, then the variables are arranged in to (n-m) dimensionless terms. These dimensionless terms are called Pi	Understand	CO3	CLO.10 CLO.09	AAE515.10 AAE515.09
3	problems? Why is dimensional analysis important? State Buckingham Pi Theorem	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a dimensionally homogeneous equation and if these contain m fundamental dimensions, then the variables are arranged in to (n-m) dimensionless terms. These dimensionless terms are called Pi terms"	Understand	CO3	CLO.10 CLO.09	AAE515.10 AAE515.09
3 4 5	problems? Why is dimensional analysis important? State Buckingham Pi Theorem Define	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a dimensionally homogeneous equation and if these contain m fundamental dimensions, then the variables are arranged in to (n-m) dimensionless terms. These dimensionless terms are called Pi terms" It is defined as the ratio of inertia	Remember	CO3 CO3	CLO.10 CLO.09 CLO.09	AAE515.10 AAE515.09 AAE515.09
3 4 5	problems? Why is dimensional analysis important? State Buckingham Pi Theorem Define Reynold's	expression can be multiplied by one without changing its value. It is a useful technique. It is very important to understand the physical nature of the problem. Then it is only about solving simple mathematical equations. Therefore the dimensional analysis is a useful method for students with weaker mathematical skills too. Buckingham Pi theorem states "If there are n variables in a dimensionally homogeneous equation and if these contain m fundamental dimensions, then the variables are arranged in to (n-m) dimensionless terms. These dimensionless terms are called Pi terms" It is defined as the ratio of inertia force to viscous force. Re =	Remember	CO3 CO3	CLO.10 CLO.09 CLO.09	AAE515.10 AAE515.09 AAE515.09

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		$Re = \rho v d / v$				
6	Define	Nusselt number (Nu) is the ratio	Remember	CO3	CLO.09	AAE515.09
	Nusselt	of convective to conductive heat				
	number	transfer across (normal to) the				
		boundary. In this context,				
		convection includes both				
		advection and diffusion				
		It is represented by Nu				
		Nu = convective heat transfer/				
		conductive heat transfer				
		Nu = hL / k				
7	Define	Prandtl group is a dimensionless,	Remember	CO3	CLO.09	AAE515.09
	Prandtl	defined as the ratio of momentum				
	number	diffusivity to thermal diffusivity.				
		That is, the Prandtl number is				
		given as:				
		$PT = C_p \mu/K$				
		where, c <sub>p</sub> is specific field				
		k is thermal conductivity				
8	Define	It is defined as the ratio of	Remember	CO3	CLO 09	A A E 5 1 5 0 9
0	Grashof	product of inertia force and	Remember	COS	CLO.07	AALJ15.07
	number	buoyancy force to the square of				
		viscous force. $Gr = Inertia force x$				
		Buoyancy force / [Viscous				
		force]2				
9	Define	It is the ratio of Nusselt number	Remember	CO3	CLO.09	AAE515.09
	Stanton	to the product of Reynolds		-		
	number.	number and Prandtl number				
10	Define	The thickness of the boundary layer	Understand	CO3	CLO.13	AAE515.13
	boundary	has been defined as the distance				
	layer	from the surface at which the local				
	thickness	velocity or temperature reaches	-	_		
		99% of the external velocity or				
		temperature.		_		
11	What is	In thermal boundary layer	Understand	CO3	CLO 13	AAE515 13
11	thermal	temperature of fluid is less than	Onderstand	005	CL0.15	AAL515.15
	boundary	99% of free stream temperature.		/	-	
	layer?	real real real real real real real real		· · · ·		
12	What is	In hydrodynamic boundary layer,	Understand	CO3	CLO.13	AAE515.13
	hydrodynami	velocity of the fluid is less than		- 6		
	c boundary	99% of free stream velocity		0.7	100	
	layer?	U.A.		0		
13	Define	The displacement thickness is the		CO3	CLO.13	AAE515.13
	displacement	distance, measured perpendicular	P			
	thickness	to the boundary, by which the				
		free stream is displaced on				
		account of formation of boundary				
1.4	W/h at is	layer.	I in denotors d	CO2	CL O 12	A A E 515 12
14	what is	If the fluid motion is artificially	Understand	COS	CL0.13	AAE515.15
	convection?	force like a blower or fan that				
		type of heat transfer is known as				
		forced convection				
15	What is	If the fluid motion is produced	Understand	CO3	CLO.13	AAE515.13
-	meant by	due to change in density resulting				
	free or	from temperature gradients, the				
	natural	mode of heat transfer is said to				
	convection?	be natural convection.				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	СО	CLO	CLO Code
16	What are the	Reynolds number (Re)	Understand	CO3	CLO.09	AAE515.09
	dimensionles	Nusselt number (Nu)				
	s parameters	Prandtl number (Pr)				
	used in free	Grashofnumber(Gr)				
	and forced					
17	Define	The thickness of the boundary	Understand	CO3	CL 0 13	AAE515 13
1 /	boundary	layer has been defined as the	Understand	COS	CL0.15	AAL515.15
	laver	distance from the surface at				
	thickness	which the local velocity or				
		temperature reaches 99% of the				
		external velocity or temperature.				
18	Indicate the	In the boundary layer concept the	Understand	CO3	CLO.13	AAE515.13
	concept or	flow field over a body is divided				
	significance	in to two regions:				
	of boundary	A thin region near the body				
	layer	the velocity and the temperature				
		gradients are large.				
		The region outside the boundary				
		layer where the velocity and				
		temperature gradients are very				
		nearly equal to their free stream				
		velocity values				
		LINUT	IX			
		UNIT	- I V			
1	Define	The change of phase from liquid	Understand	CO4	CLO.14	AAE515.14
	Boiling	to vapour state is known as				
		boiling. It occurs when is heated				
-	XX 71 . ·	to boiling point.	TT 1 / 1	004	CL 0.15	
2	What is	The change of phase from vapour	Understand	CO4	CL0.15	AAE515.15
	condensation	condensation A pure substance	-			
	?	condenses at a temperature equal		_	1 1	
		to its boiling point.		_		
3	Give the	Boiling and condensation	Understand	CO4	CLO.14	AAE515.14
	application	process finds wide applications			-	
	of boiling	as mentioned below:		/	100	
	and	• Thermal and nuclear power			A 1	
	condensation	plants		1.1	S	
	•	Refrigerating systems		- 14		
		• Process of heating and		Q. 1		
		cooling	~ \ \	· · · ·		
1	What is	Air conditioning systems     Nucleate boiling is a type of	Understand	CO4	CIO 14	ΔΔΕ515 14
4	mean by	boiling that takes place when the	Understand	04	CL0.14	AAEJ1J.14
	nucleate pool	surface temperature is hotter than				
	boiling?	the saturated fluid temperature by				
	-	a certain amount but where the				
		heat flux is below the critical heat				
		flux. The critical heat flux is the				
		peak on the curve between				
		nucleate boiling and transition				
5	Whatic	Dolling Dool boiling is the process in	Understand	<u>CO4</u>		ΔΔΕ515 14
3	what is meant by	which the heating surface is	Understand	04	CL0.14	AAEJ13.14
	noal boiling?	submerged in a large body of				
	Poor bonning:	stagnant liquid. The relative				
		motion of the vapor produced and				

1       the surrounding liquid near the bearing surface is due primarily to the buoyancy effect of the vapor of the uoyancy effect of the vapor of condensation. Film-wise condensation Direct contact condensation and there is forms a continuous film over the vapor condensation a film over the condensation is the surface is known as film over the react the vapor condenses into small liquid drom on the surface is known as film over the random fashion.       CO4       CL0.15       AAE515.16         8       What is in a find provise condensation, the vapor condenses into small liquid drom on the surface is nownall liquid drom on the surface is nownall liquid contact with a cold liquid. As in the condensation is to contact with a cold liquid. As in the condensation steam and there is forter contact contact between the exhaust steam and there is forter contact with a cold liquid. As in the condenses, the condense is no small liquid contact with a cold liquid. As in the condenses, the condense is the conding water is sprayed on the exhaust steam and there is forter contact with a cold liquid. As informated thuid temperature by accruit anound bu where the boiling?       CO4       CL0.15       AAE515.14         10       What is the pupped of booling?       What is the a liquid reaches its boiling which rise into the surface torough the surface torough the surface torough the surface strate and burst is forter or and the surface arrough the heat flux.       CO4       CL0.14       AAE515.14         11       What is the material based more strate and burst is forter than the surface torough the surface to	S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
1     heating surface is due primarily to the browyancy effect of the vapor     Inderstand     CO4     CL0.15     AAE515.15       6     What are the modes of condensation Effin-wise condensation Direct contact condensation Direct contact     Understand     CO4     CL0.15     AAE515.16       7     What is meant by frim-wige condensation     The fuguid condensate wets the solid surface, spreads out and forms a continuous film over the condensation     Understand     CO4     CL0.16     AAE515.16       8     What is meant by drop-wise condensation     In drop-wise condensation the vapor condenses into small liquid droplets of various sizes which forms a continuous film over the context with a colliguid. As in get condenses, the cooling water is sprayed on the surface in random fashion.     Understand     CO4     CL0.15     AAE515.15       9     What is meant by Direct context with a colliguid. As in jet condenses, the cooling water.     Understand     CO4     CL0.15     AAE515.15       10     What is is prayed on the exhaust scam and there is direct contact pervene the exhaust scam and cooling water.     CO4     CL0.14     AAE515.14       11     What is the purpose of boiling that takes place when the burst into the air. This process is called boiling is a type of boiling that takes place when the heat flux is blow the critical heat flux, is label whe critical heat flux is called boiling is a type of boiling that takes place when the heat flux is blow the critical heat flux is called boiling is a type of boiling.     Understand flux is proves to gats form in the same tengy call		•	the surrounding liquid near the				
Image of the broyancy effect of the vapor         Image of vapor         Image of vapor           6         What are the condensation Drop-wise condensation Drop-wise condensation Drop-wise condensation Drop-wise condensation Drop-wise condensation Drop-wise condensation on the vapor conducts out and forms a continuous film over the entire surface is hown as film vare the remease with a cold strate spreade state in the vapor condenses into small liquid drop-wise condensation. The liquid condensate wets the vapor condenses into small liquid drop-wise condensation. The vapor condenses into small liquid drop-wise condensation. The vapor condenses into small liquid drop-wise condensation.         Understand         CO4         CL0.16         AAE515.16           8         What is the vapor condenses into small liquid drop-wise condensation.         Understand         CO4         CL0.15         AAE515.15           9         What is the vapor condenses the cooling water.         Understand         CO4         CL0.15         AAE515.15           9         What is the surface temperature is a type of boiling that takes place when the surface temperature is there than the statmated fluid temperature by a certain amount but where the beat flux is below the critical heat fluid temperature by a certain subout boiling. If the boiling is the boiling of the entry of boiling the takes of gas form in the material's surface or that cald fluid drop entry is a direct or the advertage and barrs in boiling the takes of the change and barrs in the the attrace defined as the ratio of a perfect emitter) at the same temperature is a direct or that cald drop a perfect backbody of the same temperature dowan or is but the liquid bies nore grickly.			heating surface is due primarily				
Image: condensation proposition proposition of condensation proposition of condensation Direct contact condensation proposition of condensation proposition of condensation proposition of proposition proposition of proposition precoproposi proproproposition proposition proposition proposition pr			to the buoyancy effect of the				
6       What are the modes of condensation: Film-wise condensation Direct contact condensation Direct contact condensation Direct contact condensation       Understand       CO4       CL0.15       AAE515.15         7       What is meant by film wise condensation       The liquid condensate wets the meant by recondensation. The vert the entre surface is known as film wise condensation. The wapor condenses into small liquid drop-wise condensation.       Understand       CO4       CL0.16       AAE515.16         8       What is meant by drop-wise condensation.       In drop-wise condensation, the vapor condenses into small liquid drop wise condensation.       Understand       CO4       CL0.15       AAE515.15         9       What is meant by Direct contact with a cold liquid. As readoms a there is direct contact between the exhaust steam and condensation       CO4       CL0.15       AAE515.15         10       What is Nucleate boiling?       Nucleate boiling is a type of boiling?       Understand water is grayed on the exhaust steam and there is direct contact the surface tomperature is boilthe a certait boiling. If the boiling is a citled boiling. If the boiling a certait amount but where the heat flux is bleow the critical heat flux is prove grayed and there is direct and there is direct and there is direct and the subtrace and burst into the air. This process is called boiling. If the boiling fluid is heated more strongly the temperature does on rise but the fluid boils nore quickly       CO4       CL0.14       AAE515.17         11       What is the miteri at the same temperature and wavelength and under the			vapor				
modes of condensation       condensation Film-wise condensation Direct contact condensation       Understand       CO4       CL0.16       AAE515.16         7       What is meant by Film-wise condensation       The liquid condensate wets the solid surface, spreads out and entire surface is known as film over the condensation       Understand       CO4       CL0.16       AAE515.16         8       What is meant by drop-wise condensation fill condensation       In drop-wise condensation, the vapor condenses into small liquid drop-wise condensation fill random fashion       Understand       CO4       CL0.15       AAE515.15         9       What is meant by into contact with a coll liquid. As condensation       It occurs when vapor is brought in jet condensers, the cooling water is sprayed on the exhaust set and there is direct contact vater is sprayed on the exhaust steam and there is fore contact with a coll liquid. As contact with coll liquid. As contact with a liquid reaches its	6	What are the	There are three modes of	Understand	CO4	CLO.15	AAE515.15
condensation       condensation       Direct contact condensation       CO4       CL0.16       AAE515.16         7       What is meant by solid surface, spreads out and forms a continuous film over the condensation       Understand       CO4       CL0.16       AAE515.16         8       What is meant by vise condensation fill down on the surface in random fashion.       Understand       CO4       CL0.15       AAE515.15         9       What is meant by into contact contensation       In drop-wise condensation fill down on the surface in random fashion.       CO4       CL0.15       AAE515.15         9       What is in jet condensers, the cooling vater.       CO4       CL0.15       AAE515.15         10       What is the variable condensation just down on the surface in random fashion.       Understand vater.       CO4       CL0.14       AAE515.14         11       What is the purpose of boiling?       When a liquid reaches its boiling vaturated flid temperature by a cartain amount but where the heard flux is bledw the critical hear flux is bledw the ritical hear flux is bledw theares is boiling the hear flux is bledw thear strong the		modes of	condensation: Film-wise				
?       condensation Direct contact condensation       v       condensation         7       What is meant by Film-wise condensation       The liquid condensate wets the solid surface, spreads out and form as continuous film over the entire surface is known as film wets condensation       Understand       CO4       CLO.16       AAE515.16         8       What is meant by drop-wise condensation       In drop-wise condensation, the water condensation of random fashion       Understand       CO4       CLO.15       AAE515.15         9       What is meant by into contact with a coll liquid. As condensation       In drop-wise condensation, the water is sprayed on the exhaust steam and there is direct contact point a contact with a coll liquid. As conding water.       CO4       CLO.15       AAE515.15         10       What is between the exhaust steam and cooling water.       Understand       CO4       CLO.14       AAE515.14         11       What is boiling?       Nucleate boiling is a type of boiling?       Understand       CO4       CLO.14       AAE515.14         12       Define Emissivity?       When a liquid reaches is boiling liquid is heated more strongly the temperature doss nor rise but the temperature dos nor rise but the temperature dos nor rise but the temperature dow nor spresecond (wats) per square meter (Win?). Emissivity is the ratio of a surface's ability to entir radiant entirs of the serge resco		condensation	condensation Drop-wise				
econdensation     condensation       7     What is meant by Film-wise condensatione     The liquid condensate wets the solid surface, spreads out and forms a continuous film over the condensatione     Understand     CO4     CL0.16     AAE515.16       8     What is meant by drop-wise condensation, the wapor condenses into small liquid droptets of various sizes which fall down on the surface in random fashion.     Understand     CO4     CL0.15     AAE515.15       9     What is meant by Direct contact contact contact contact     It occurs when vapor is brought into contact with a cold liquid. As in the condensers, the cooling water is sprayed on the exhaust steam and there is direct ontact econdensation?     CO4     CL0.15     AAE515.15       10     What is meant by Direct contact     Nucleate boiling is a type of boiling that takes place when the surface temperature is hotter than the saturact fluid temperature by a certain amount but where the heat flux is below the critical heat flux is below the nits process is called boiling. If the boiling liquid is heatd more strongly the temperature does not rise but the fliquid boils more quickly     CO4     CL0.17     AAE515.17       12     Define Emissivity?     Emissivity is defined as the ratio of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emiter).     Understand flow of a perfect enel(Wm?). Emissivity (1) is the ratio of a surface's ability to envir adiantive eminestonles sumber between (0 functs) per square meter (W/		?	condensation Direct contact				
7       What is meant by solid surface, spreads out and forms a continuous film over the entire surface is known as film over the entire surface is known as film over the condensation?       CO4       CLO.16       AAE515.16         8       What is meant by vapor condenses into small liquid drop-wise condensation, the random fashion and the surface in random fashion and the surface in random fashion is in toronate with a coll liquid. As in jet condensation is the weat and there is direct contact is not active it and coll liquid. As in jet condenses in the colling water is sprayed on the exhaust steam and there is direct contact is not active it and coll liquid. As in the surface temperature is hold the surface in point bobiling that takes place when the surface temperature is hold the surface in point bubbles of gas form in it which is is in the surface matrix is bold the critical heat flux. is below the critical heat flux is below the erg cardinal core strongly the temperature does not rise but the temperature and wavelength and under the same temperature is and wavelength and under the same temperature is the same temperature is the same temperature is a prover of flux is priven jourdes per second (watts) per square meter (Wm2). Emissivity (2) is the ratio of a surface' sability to emit radiant energy compared wit			condensation				
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Film-wise condensation       forms a continuous film over the entire surface is known as film wise condensation       Understand       CO4       CLO.15       AAE515.15         8       What is meant by condensation       In drop-wise condensation, the wise condensation       Understand       CO4       CLO.15       AAE515.15         9       What is meant by condensation       It occurs when vapor is brought in jet conducers, the cooling contact with a cold liquid. As in jet conducers, the cooling contact with a cold liquid. As in jet conducers, the cooling water.       CO4       CLO.15       AAE515.15         10       What is boiling?       Nucleate boiling is a type of boiling that takes place when the beat flux is below the critical heat flux.       Understand       CO4       CLO.14       AAE515.14         11       What is the purpose of boiling?       When a liquid reaches its boiling point bubbles of gas form in it which rise int the surface and burst into the air. This process is called boiling, it defined as the ratio called boiling.       Understand       CO4       CLO.14       AAE515.14         12       Define Emissivity?       Emissivity is defined as the ratio from a blackbody (a perfect emiter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (vatis) per square meter (Wm2). Emissivity?       Understand (vatis) per square meter (Wm2). Emissivity?       CO4       CLO.17       AAE515.17         13       What is the writs of turks of Emissivity? </td <td></td> <td>meant by</td> <td>solid surface, spreads out and</td> <td></td> <td></td> <td></td> <td></td>		meant by	solid surface, spreads out and				
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?       wise condensation, the mean by information of the second ensation, the mean by approximate condenses into small liquid drop-wise condenses into second the second second drop wise is provide on the exhaust second mean type into contact with a cold liquid. As in jet condensers, the cooling water contact with a cold liquid. As in jet condensers, the cooling water is sprayed on the exhaust steam and there is direct contact between the exhaust steam and cooling water.       CO4       CL0.15       AAE515.15         10       What is Nucleate boiling is a type of boiling?       Understand cooling water.       CO4       CL0.14       AAE515.14         11       What is whrea liquid reaches its boiling point bubbles of gas form in it which rise into the surface and burst into the surface to that radiated from a blackbody (a perfect emister)       Understand       CO4       CL0.14       AAE515.17         11       What is the units of this given in joules per second (wats) per square meter (Wim?). Emissivity?       Understand of a perfect real head from a blackbody (a perfect emitter) and 11 (for a perfect relice) and 11 (for a perfect relice) and 11 (for a perfect remi		condensation	entire surface is known as film				
8       What is meant by condensation ?       In drop-wise condensation, the vapor condenses into small liquid drop-wise fall down on the surface in random fashion.       Understand       CO4       CLO.15       AAE515.15         9       What is meant by Direct in jet condenses, the cooling contact condensation       It occurs when vapor is brought into contact with a cold liquid. As into contact with a cold liquid. As power is sprayed on the exhaust condensation       CO4       CLO.15       AAE515.15         10       What is Nucleate boiling is a type of boiling?       Understand the saturated fluid temperature by a certain amount but where the heat flux is below the critical heat flux.       Understand boiling.1       CO4       CLO.14       AAE515.14         11       What is the purpose of boiling?       When a liquid reaches its boiling point bubbles of gas form in it which rise into the surface and burst into the air. This process is called boiling. If the boiling liquid is heated more strongly the temissivity is defined as the ratio of the energy radiated from a material's surface to that radiated from a blackbody () a perfect emitter).       CO4       CLO.17       AAE515.17         12       Define Emissivity?       In the MKS unit system, radiative functions. It is a dimensionless number between 0 (for a perfect remitter).       Understand is urface's ability to emit radiant energy compared with the ability of a perfect the action a surface's ability to emit radiant energy compared with the ability of a perfect the action a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same termoreatur		?	wise condensation				
meant by drop-wise condensation ?       vapor condenses into small liquid droplets of various sizes which random fashion.       Image: Condenses, file condensers, the cooling contact water is sprayed on the exhaust steam and there is direct contact ?       CO4       CL0.15       AAE515.15         9       What is meant by Direct condensation ?       Nucleate boiling is a type of between the exhaust steam and cooling water.       Understand       CO4       CL0.14       AAE515.14         10       What is meant by boiling?       Nucleate boiling is a type of boiling that takes place when the surface temperature is hotter than the saturated fluid temperature by a certain amount but where the heat flux is below the critical heat flux.       Understand       CO4       CL0.14       AAE515.14         11       What is the purpose of boiling?       When a liquid reaches its boiling point bubbes of gas form in it which rise into the surface and burst into the air. This process is called boiling. If the boiling liquid bis more quickly       Understand       CO4       CL0.14       AAE515.14         12       Define Emissivity?       Emissivity is defined as the ratio of the energy radiated from a material's surface to that radiated from a blackbödy (a perfect emitter) at the same temperature and wavelength and under the same evening conditions. It is a dimensionless number between 0 (for a perfect relector) and 1 (for a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same	8	What is	In drop-wise condensation, the	Understand	CO4	CLO.15	AAE515.15
drop-wise condensation ?       droplets of various sizes which fall down on the surface in random fashion.       droplets of various sizes which fall down on the surface in random fashion.       droplets of various sizes which fall down on the surface in random fashion.       droplets of various sizes which fall down on the surface in random fashion.       droplets of various sizes which fall down on the surface in random fashion.       droplets of various sizes which fall down on the surface in random fashion.       droplets of various sizes which fall down on the surface in random fashion.       droplets of various sizes which fall down on the surface in fall condensation       droplets of various sizes which in jet condensation       droplets of various sizes which fall down on the surface in fall condensation       droplets of various sizes which is called boiling is a type of boiling?       droplets of various sizes which surface temperature is hotter than the saturated fluid temperature by a certain amount but where the heat flux is below the critical heat flux.       Understand       CO4       CL0.14       AAE515.14         11       What is the purpose of boiling?       When a liquid reaches its boiling point bubbles of gas form in it which rise into the surface and burst into the surface and burst into the satiface from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect remitter).       Understand       CO4       CL0.17       AAE515.17         13       What is the units of Emissivity?       He dow KS unit system, radiative fl		meant by	vapor condenses into small liquid				
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9       What is meant by Direct contact condensation       1 cocurs when vapor is brought into contact with a cold liquid. As in jet condensers, the cooling water is sprayed on the exhaust steam and there is direct contact between the exhaust steam and cooling water.       CO4       CLO.15       AAE515.15         10       What is       Nucleate boiling is a type of boiling?       Understand boiling that takes place when the surface temperature is hotter than the saturated fluid temperature by a certain amount but where the heat flux is below the critical heat flux.       CO4       CLO.14       AAE515.14         11       What is the purpose of boiling?       When a liquid reaches its boiling point bubbles of gas form in it which rise into the surface and burst into the air. This process is called boiling. If the boiling liquid is heated more strongly the temperature does not rise but the liquid boils more quickly       CO4       CLO.17       AAE515.17         12       Define       Emissivity is defined as the ratio of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect meinter).       Understand       CO4       CLO.17       AAE515.17         13       What is the units of Emissivity (is the ratio of a surface's ability to emit radiatien emerature       In the MKS unit system, radiative flux is given in joules per second (watts) per square meter (Wm2). Emissivity (is is the ratio of a surface's ability to emit radiatien emerature       Understand		?	random fashion.				
meant by Direct contact condensation       into contact with a cold liquid. As in jet condensers, the cooling water is sprayed on the exhaust steam and there is direct contact between the exhaust steam and cooling water.       Understand       CO4       CL0.14       AAE515.14         10       What is Nucleate       Nucleate boiling is a type of boiling that takes place when the heat flux is below the eritical heat flux.       Understand       CO4       CL0.14       AAE515.14         11       What is the purpose of boiling?       When a liquid reaches its boiling point bubbles of gas form in it which rise into the surface and burst into the air. This process is called boiling. If the boiling liquid bils more quickly       Understand       CO4       CL0.14       AAE515.14         12       Define       Emissivity is defined as the ratio of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect effector) and 1 (for a perfect effector) and 1 (for a surface's ability to emit radiatied from sigven in joules per second (watts) per square meter (W/m <sup>2</sup> ). Emissivity?       Understand fux is given in joules per second (watts) per square meter (W/m <sup>2</sup> ). Emissivity () is the ratio of a surface's ability to emit radiatien emerature and are at the same temperature       CO4       CL0.17       AAE515.17	9	What is	It occurs when vapor is brought		CO4	CLO.15	AAE515.15
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?       between the exhaust steam and cooling water.         10       What is Nucleate boiling is a type of boiling?       Nucleate boiling is a type of boiling that takes place when the surface temperature is hotter than the saturated fluid temperature by a certain amount but where the heat flux is below the critical heat flux.       CO4       CLO.14       AAE515.14         11       What is the purpose of boiling?       When a liquid reaches its boiling that takes place and thus is below the critical heat flux.       Understand       CO4       CLO.14       AAE515.14         11       What is the purpose of boiling?       When a liquid reaches its boiling that take the surface and thus is head that is the temperature does not rise but the liquid boils more quickly       Understand       CO4       CLO.14       AAE515.14         12       Define       Emissivity is defined as the ratio of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect black body of the same area at the same temperature emerge the ability of a perfect black body of the same area at the same temperature and the ability of a perfect black body of the same area at the same temperature the attemperature the same tare at the same temperature the atin the same temperature and the ability of a perfect black body of		condensation	steam and there is direct contact				
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boiling?       surface temperature is hotter than the saturated fluid temperature by a certain amount but where the heat flux is below the critical heat flux.       Understand       CO4       CL0.14       AAE515.14         11       What is the point bubbles of gas form in it which rise into the surface and burst into the air. This process is called boiling. If the boiling liquid is heated more strongly the temperature does not rise but the liquid boils more quickly       Understand       CO4       CL0.14       AAE515.14         12       Define       Emissivity is defined as the ratio of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect reflector) and 1 (for a perfect reflector) and 1 (for a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature       Understand       CO4       CL0.17       AAE515.17		Nucleate	boiling that takes place when the				
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12       Define       Emissivity is defined as the ratio       Understand       CO4       CLO.17       AAE515.17         12       Define       Emissivity is defined as the ratio       Understand       CO4       CLO.17       AAE515.17         12       Define       Emissivity is defined as the ratio       Understand       CO4       CLO.17       AAE515.17         14       Emissivity?       of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect emitter).       In the MKS unit system, radiative flux is given in joules per second (watts) per square meter (W/m²). Emissivity?       Understand       CO4       CLO.17       AAE515.17         13       What is the units of Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature       CO4       CLO.17       AAE515.17			burst into the air. This process is				
12       Define       Emissivity is defined as the ratio       Understand       CO4       CLO.17       AAE515.17         12       Define       Emissivity is defined as the ratio       Understand       CO4       CLO.17       AAE515.17         12       Define       Emissivity?       of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect emitter).       Understand       CO4       CLO.17       AAE515.17         13       What is the units of Emissivity?       In the MKS unit system, radiative (watts) per square meter (W/m²). Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temmerature       CO4       CLO.17       AAE515.17			called boiling. If the boiling				
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12       Define       Emissivity is defined as the ratio of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect emitter).       Understand       CO4       CLO.17       AAE515.17         13       What is the units of Emissivity?       In the MKS unit system, radiative flux is given in joules per second (watts) per square meter (W/m <sup>2</sup> ). Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature       CO4       CLO.17       AAE515.17			temperature does not rise but the			A	
12       Define       Emissivity is defined as the ratio       Understand       CO4       CL0.17       AAES15.17         Emissivity?       of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect emitter).       In the MKS unit system, radiative flux is given in joules per second (watts) per square meter (W/m²). Emissivity?       Understand       CO4       CL0.17       AAE515.17         13       What is the units of Emissivity?       In the MKS unit system, radiative flux is given in joules per second (watts) per square meter (W/m²). Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature       CO4       CL0.17       AAE515.17	10	<b>D</b> (	liquid boils more quickly		004	CL 0 17	
Emissivity?       of the energy radiated from a material's surface to that radiated from a blackbody (a perfect emitter) at the same temperature and wavelength and under the same viewing conditions. It is a dimensionless number between 0 (for a perfect reflector) and 1 (for a perfect emitter).         13       What is the units of flux is given in joules per second Emissivity?       Understand       CO4       CLO.17       AAE515.17         Emissivity?       (watts) per square meter (W/m²). Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature       Image: Compared with the ability of a perfect black body of the same area at the same temperature	12	Define	Emissivity is defined as the ratio	Understand	CO4	CL0.17	AAE515.17
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13       What is the units of Emissivity?       In the MKS unit system, radiative flux is given in joules per second (watts) per square meter (W/m <sup>2</sup> ). Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature.       Understand       CO4       CLO.17       AAE515.17			emilier) at the same temperature	1.1			
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13       What is the units of flux is given in joules per second (watts) per square meter (W/m²). Emissivity?       Understand       CO4       CLO.17       AAE515.17         Emissivity?       (watts) per square meter (W/m²). Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature       Image: Compare temperature       Image: Compare temperature       Image: Compare temperature       Image: Compare temperature			dimonsionlass number between 0				
13       What is the units of Emissivity?       In the MKS unit system, radiative flux is given in joules per second (watts) per square meter (W/m²). Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature.       Understand       CO4       CLO.17       AAE515.17			(for a perfect reflector) and 1 (for				
13       What is the units of flux is given in joules per second Emissivity?       In the MKS unit system, radiative flux is given in joules per second (watts) per square meter (W/m <sup>2</sup> ). Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature.       CO4       CLO.17       AAE515.17			a perfect emitter)				
15       What is the minimum visual and system, radiative of the stand condition of the system, radiative of the same area at the same temperature.       CLO: 17       AAES13.17	12	What is the	In the MKS unit system radiative	Understand	CO4	CL 0 17	ΔΔ <b>Ε</b> 515 17
Emissivity?       (watts) per square meter (W/m²).         Emissivity?       Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature.	15	units of	flux is given in joules per second	Understand	04	CL0.1/	AALJ13.17
Emissivity () is the ratio of a surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature		Emissivity?	(watts) per square meter $(W/m^2)$				
surface's ability to emit radiant energy compared with the ability of a perfect black body of the same area at the same temperature		Linissivity :	$(waits)$ per square inelet $(w/in^2)$ . Emissivity () is the ratio of a				
energy compared with the ability of a perfect black body of the same area at the same temperature			surface's ability to emit radiant				
of a perfect black body of the same area at the same temperature			energy compared with the ability				
same area at the same temperature			of a perfect black body of the				
temperature			same area at the same				
temperature			temperature				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	СО	CLO	CLO Code
14	What is	It a measure of the ability of a	Understand	CO4	CLO.17	AAE515.17
	meant by	surface to reflect radiation, equal				
	reflectivity?	to the reflectance of a layer of				
	•	material sufficiently thick for the				
		reflectance not to depend on the				
		thickness. Symbol is ρ				
15	What is	Absorptivity is defined as the	Understand	CO4	CLO.18	AAE515.18
	meant by	ratio between radiation absorbed				
	absorptivity?	and incident radiation. Symbol is				
		α				
16	State Stefan-	The emissive power of a	Remember	CO4	CLO.18	AAE515.18
	Bolzmann	blackbody is proportional to the				
	law	fourth power of absolute				
		temperature				
		$Q = AT^4$				
17	State Wien's	The Wien's law gives the	Remember	CO4	CLO.18	AAE515.18
	displacement	relationship between temperature				
	law.	and wavelength corresponding to				
		the maximum spectral emissive				
		power of the black body at that				
		temperature				
18	State	This law states that the ratio of	Remember	CO4	CLO.18	AAE515.18
	Kirchoff's	total emissive power to the				
	law of	absorptivity is constant for all				
	radiation.	surfaces which are in thermal				
		equilibrium with the surroundings				
19	What is the	The Stefan-Boltzmann law says	Remember	CO4	CLO.18	AAE515.18
	difference	that the total energy radiated from				
	between the	a blackbody is proportional to the				
	Stefan	fourth power of its temperature,				
	Boltzmann	while Wien's law is the				
	law and	relationship between the				
	Wien's law	wavelength of maximum	-	_		
		intensity a blackbody emits and				-
20	XX71	Its temperature.	The desired and	004	CL O 19	A A T 5 1 5 1 9
20	What is	the experience of compating to	Understand	C04	CL0.18	AAE515.18
	hatwaan	rediction <b>Dediction</b> has a broad			A	
	rediction and	manning accurring different accord				
	irradiation?	of transforring onergy including		r		
	in adiation :	alectromagnetic radiation and		·	0	
		nuclear radiation Irradiation		1		
		refers specifically to a process by		~ ~	1	
		which an object is exposed to		Q. 1		
		radiation	- 11	~		
21	State	It states the total emissive power	Remember	C04	CLO 17	AAE515 17
21	Lambert's	from a radiating plane surface in	Remember	004	CL0.17	11111010111
	cosine law	any direction is proportional to				
	cosine iuw.	the cosine of the angle of				
		emission				
		UNIT	$-\mathbf{V}$			
1	Define heat	A heat exchanger is a system	Understand	CO5	CLO.19	AAE515.19
	exchanger?	designed to transfer heat between				
	-	two fluids to control the				
		temperature of one of the fluids.				
		A heat exchanger could remove				
		thermal energy from a fluid used				
		in an air-conditioning system or				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		add thermal energy to a system				
		where processes require a certain				
		temperature to work properly				
2	What are the	• Direct contact heat	Understand	CO5	CLO.19	AAE515.19
	types of heat	exchangers				
	exchangers?	<ul> <li>Indirect contact heat</li> </ul>				
		exchangers				
		<ul> <li>Surface heat exchangers</li> </ul>				
		• Parallel flow heat				
		exchangers				
		Counter flow heat				
		exchangers				
		• Cross flow heat exchangers			-	
		• Shell and tube heat				
		exchangers				
		Compact heat exchangers		<b><i><i>a</i> a</i> <b><i>i</i></b></b>	<b>AX A A</b>	
3	What is	Condenser is also a heat	Understand	CO5	CLO.19	AAE515.19
	difference	exchanger. The main difference				
	between neat	between these two is that in heat				
	exchanger	without phase change and in				
	anu condenser?	condenser heat is transferred				
	condenser :	along with the phase change				
4	What is	An open system is defined as a	Understand	CO5	<b>CLO</b> .19	AAE515.19
•	mean by	"system in exchange of matter	Chucistand	000	02011	
	open and	with its environment, presenting				
	closed heat	import and export, building-up				
	exchanger?	and breaking-down of its material				
		components." Closed systems, on				
		the other hand, are held to be				
		isolated from their environment.			1000	
5	What is	The is the most common type of	Understand	CO5	CLO.19	AAE515.19
	mean by	heat exchangers in which the hot	- 1	_	<b>7</b>	
	Recuperators	and cold fluid do not come into		_	<b>7</b> 4	
	?	direct contact with each other but				
		surface				
6	What is	In this type of heat exchangers.	Understand	CO5	CLO.19	AAE515.19
Ũ	meant by	hot and cold fluids flow	Chiefstand	000	02011	
	Regenerators	alternately through the same			0	
	?	space		1		
7	What are the	A heat exchanger can have	Understand	CO5	CLO.19	AAE515.19
	types of heat	several different flow patterns.		S. 1		
	exchangers	Counter flow, parallel flow, and	- 1	~		
	according	cross flow are common heat	H -			
	flow	exchanger types. A counter flow				
		heat exchanger is the most				
0	Whatia	In this type, bot and cold fluids	Un donaton d	CO5	CLO 10	A A E 5 1 5 1 0
0	what is meant by	move in the same direction	Understand	COS	CL0.19	AAEJ1J.19
	narallel flow					
	heat					
	exchangers?					
9	What is	In this type, hot and cold fluids	Understand	CO5	CLO.19	AAE515.19
	meant by	move in parallel but in opposite				
	counter flow	directions				
	heat					
	exchangers?					

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	СО	CLO	CLO Code
10	What is	In this type, hot and cold fluids	Understand	CO5	CLO.19	AAE515.19
	meant by	move at right angles to each				
	cross flow	other.				
	heat					
	exchangers?					
11	What is	The heat exchangers have tube	Understand	CO5	CLO.19	AAE515.19
	meant by	walls, which allow the exchange				
	shell and	of heat between two fluids. The				
	tube heat	overall heat transfer coefficient of				
	exchangers?	the heat exchanger depends on				
		the configuration you choose.				
		There are different types of shell				
		and tube heat exchangers, which				
		are used in a variety of different				
		applications				
12	What is the	In a two-phase heat exchanger, a	Understand	CO5	CLO.19	AAE515.19
	purpose of a	liquid can be heated to the point				
	shell and	that it is boiled into a gas or it				
	tube heat	may be used for the purpose of				
	exchanger?	cooling a vapor so that it can then				
		be condensed into a liquid. Such				
		phase changes typically take				
		place on the shell side of the shell				
12	W/h at is	There are many analish number	I la denoten d	COF	<b>CLO</b> 10	A A E 5 1 5 1 0
15	what is	heat avaluation applied compact	Understand	COS	CL0.19	AAE515.19
	compact heat	heat exchangers. They are				
	exchangers?	generally employed when	_			
	exchangers:	convective heat transfer				
		coefficient associated with one of				
		the fluids is much smaller than				
		that associated with the other			100	
		fluid				
14	What is	Log Mean Temperature	Understand	CO5	CLO.20	AAE515.20
	meant by	Difference or LMTD is the			<b>7</b> 4	
	LMTD?	driving force for the amount of				
		exchanged heat by a heat				
		exchanger. LMTD( $(\Delta T)_{m}$ )			_	
		approach is quite straight forward		/	- Contract	
		and simple. But this approach				
		cannot be used for the cases,			Q~	
		where phase change occurs in the		C		
		heat exchanger. the total heat		0.	r	
		transfer rate in that heat		0		
		exchanger is expressed as	0	1.00		
		$Q = U A (\Delta I)_m$	PN			
		Q – Heat duty of the heat				
		exchanger (in watts)				
		U – Heat transfer co-efficient (in				
		A Heat transfer area (in mater				
		A – neat transfer area (in meter				
15	What is	The fouling factor represents the	Understand	CO5	CI O 20	AAF515 20
15	meant hv	theoretical resistance to heat flow	Understand		CL0.20	11111010.20
	fouling	due to a build-up of a layer of dirt				
	factor?	or other fouling substance on the				
		tube surfaces of the heat				
		exchanger, but they are often				
		overstated by the end user in an				
		attempt to minimize the				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		frequency of cleaning It is represented by "f".				
16	What is meant by NTU?	The Number of Transfer Units (NTU) Method is used to calculate the rate of heat transfer in heat exchangers (especially counter current exchangers) when there is insufficient information to calculate the Log-Mean Temperature Difference (LMTD NTU = UA/C <sub>min</sub>	Understand	CO5	CLO.20	AAE515.20
17	What is effectiveness ?	Effectiveness ( $\epsilon$ ), is defined as the ratio of the actual heat transfer rate to the maximum possible heat transfer rate for the given flow and temperature conditions $\epsilon = Q/Q_{max}$	Understand	CO5	CLO.20	AAE515.20
18	What advantage does the effectiveness NTU method have over the LMTD method?	The effectiveness-NTU and LMTD methods are equivalent. An advantage of the effectiveness-NTU method is its ability to predict the outlet temperatures without resorting to a numerical iterative solution of a system of nonlinear equations	Understand	CO5	CLO.20	AAE515.20

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