# IARE NO.

# **INSTITUTE OF AERONAUTICAL ENGINEERING**

(Autonomous)

Dundigal, Hyderabad - 500 043

## **CIVIL ENGINEERING**

## **DEFINITIONS AND TERMINOLOGY QUESTION BANK**

Course Name		:	LINEAR ALGEBRA AND CALCULUS
Course Code		:	AHSB02
Program		:	B.Tech
Semester		:	I
Branch	_	:	Civil Engineering
Section		:	A, B
Course Faculty		:	Ms. P Rajani, Assistant Professor

#### **COURSE OBJECTIVES:**

The cours	The course should enable the students to:						
I	Determine rank of a matrix and solve linear differential equations of second order.						
II	Determine the characteristic roots and apply double integrals to evaluate area.						
III	Apply mean value theorems and apply triple integrals to evaluate volume.						
IV	Determine the functional dependence and extremum value of a function						
V	Analyze gradient, divergence, curl and evaluate line, surface, volume integrals over a vector field.						

#### **DEFINITIONS AND TERMINOLOGY QUESTION BANK**

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code			
	MODULE-I								
1	Define matrix.	A matrix is a rectangular array of numbers or other mathematical objects for which operations such as addition and multiplication are defined. For instance, this is a real matrix: The numbers, symbols or expressions in the matrix are called its entries or its elements.	Understand	CO 1	CLO 1	AHSB02.01			
2	Define symmetric matrix.	A square matrix is called symmetric if it is equal to its transpose.	Remember	CO 1	CLO 1	AHSB02.01			
3	Define is skew- symmetric matrix.	A square matrix is called symmetric if it is equal to negative its transpose.	Remember	CO 1	CLO 1	AHSB02.01			
4	Define hermitian matrix.	In mathematics, a Hermitian matrix (or self-adjointmatrix) is a complex square matrix that is equal to its own conjugate transpose	Remember	CO 1	CLO 1	AHSB02.01			

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
5	Define skew	A square matrix with complex	Remember	CO 1	CLO 1	AHSB02.01
	Hermitian matrix	entries is said to be skew-				
		Hermitian if its conjugate				
		transpose is the negative of the original matrix.				
6	When a matrix is	If A is a square matrix such that	Remember	CO 1	CLO1	AHSB02.01
	said to be	$A^{m}$ =0 where m is a positive	Remember	COI	CLOI	Alisb02.01
	nilpotent?	integer, then A is called				
	1	nilpotent				
7	What is	A differential equation is an	Remember	CO 1	CLO 4	AHSB02.04
	differential	equation that contains				
	equation?	derivatives which are either				
		partial derivatives or ordinary				
		derivatives. The derivatives represent a rate of change, and				
		the differential equation	$\cup$			
		describes a relationship between				
		the quantity that is continuously				
		varying and the speed of				
		change.				
8	What are types of	The types of differential	Remember	CO 1	CLO 4	AHSB02.04
	differential	equations are 1. An ordinary				
	equations?	differential equation 2. partial differential equation				
9	Mention any two	Differential equations	Remember	CO 1	CLO 4	AHSB02.04
	applications of	describe various exponential	Remember	CO 1	CEO 1	71151502.01
	differential	growths and decays.				
	equation.	2) They are also used to				
		2) They are also used to describe the change in				
		investment return over time.				
4.0	D 0 1 0			GO 1	GY O 4	1 1 1 2 2 2 2 4 4 4 4 4 4 4 4 4 4 4 4 4
10	Define order of differential	The order is the highest	Remember	CO 1	CLO 4	AHSB02.04
	equation.	numbered derivative in	- 71			
1.1	•	the equation,	D	CO 1	CLO 4	ALICDO2 O4
11	Define degree of differential	The degree is the highest	Remember	COT	CLO 4	AHSB02.04
	equation.	power to which a derivative			4	
12	•	is raised.  General solution contains	Remember	CO 1	CLO 4	AHSB02.04
12	What is general solution of higher	complementary function and	Kemember	COT	CLO 4	Ansbu2.04
	order differential	particular integral.				
	equation contains			1		
13	When a	If degree of differential equation	Understand	CO 1	CLO 4	AHSB02.04
	differential	is one then it is linear.		0		
	equation is said	T Ens				
14	to be linear? What is non-	If degree of differential equation	Remember	CO 1	CLO 1	AHSB02.01
14	linear differential	is greater than one it is linear.	Kemember	CO 1	CLO I	A113DU2.U1
	equation?	2. Securit man one it is inical.				
15	What is	A differential equation is an	Remember	CO 1	CLO 1	AHSB02.01
	differential	equation that contains derivatives				
	equation?	which are either partial				
		derivatives or ordinary				
		derivatives. The derivatives				
		represent a rate of change, and the differential equation describes				
		a relationship between the				
		quantity that is continuously				
		varying and the speed of change.				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		MODULE	-II			
1	What is Eigen value?	Any number such that a given matrix minus that number times the identity matrix has zero determinants.	Remember	CO 2	CLO 10	AHSB02.10
2	What is Eigen vector?	a vector which when operated on by a given operator gives a scalar multiple of itself.	Remember	CO 2	CLO 10	AHSB02.10
3	Define Algebraic multiplicity of a characteristic roots.	It is number of times an Eigen value is repeated.	Understand	CO 2	CLO 10	AHSB02.10
4	Define Geometric multiplicity of a characteristic roots.	It is number of linearly independent characteristic vector corresponding to the characteristic root.	Understand	CO 2	CLO 10	AHSB02.10
5	Define Orthogonal matrix.	a matrix Q is orthogonal if its transpose is equal to its inverse	Understand	CO 2	CLO 10	AHSB02.10
6	When two matrices A and B are said to orthogonal?	If B=P <sup>-1</sup> AP where P is orthogonal matrix.	Remember	CO 2	CLO 11	AHSB02.11
7	State Cayley Hamilton theorem?	It states that every square matrix satisfies its own characteristic equation.	Remember	CO 2	CLO 11	AHSB02.11
8	What is integral?	Given a function $f(x)$ that is continuous on the interval [a, b] we divide the interval into n subintervals of equal width, $\Delta x$ , and from each interval choose a point, $x*i$ . Then the definite integral of $f(x)f(x)$ from a to bb is $\int_a^b f(x)  dx = \lim_{n \to \infty} \sum_{i=1}^n f\left(x_i^*\right) \Delta x$	Remember	CO 2	CLO 11	AHSB02.14
9	What are double integrals?	The multiple integral is a definite integral of a function of more than one real variable, for example, f(x, y) or f(x, y, z). Integrals of a function of two variables over a region in R <sup>2</sup> are called double integrals.	Remember	CO 2	CLO 11	AHSB02.14
10	What are types of integrals?	Types of integrals are 1. Definite 2. Indefinite integrals.	Remember	CO 2	CLO 14	AHSB02.14
11	What are definite integrals?	A definite integral is an integral $\int_{a}^{b} f(x) dx$ with upper and lower limits. If $x$ is restricted to lie on the real line.	Remember	CO 2	CLO 14	AHSB02.14
12	What are indefinite integrals?	an integral expressed without limits, and so containing an arbitrary constant.	Remember	CO 2	CLO 10	AHSB02.10

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
13	How to calculate	The area of a closed,	Remember	CO 2	CLO 10	AHSB02.10
	area using double	bounded plane region R is				
	integral?					
		defined as				
		$A = \iint_R dA$				
		$II = \iint_R wII$				
14	What is double	Double Integrals over	Remember	CO 2	CLO 12	AHSB02.12
	integral over a	Rectangles. Recognize when				
	rectangle?	a function of two variables is				
		integral over a rectangular				
		region Use a double				
		integral to calculate the area				
		of a region, volume under a				
		surface, or average value of a	$\cup$			
		function over a plane region				
15	How do you find	The area under a curve	Remember	CO 2	CLO 12	AHSB02.12
	area between two curve?	between two points can be				
	curve?	found by doing a				
		definite integral between the				
		two points. To find the area				
		under the curve $y = f(x)$				
		between $x = a$ and $x = b$ ,				
		integrate $y = f(x)$ between the limits of a and b. Areas under				
		the x-axis will come out				
		negative and areas above the				
		x-axis will be positive.				
		x-axis will be positive.  MODULE	·III			
1	When a function	MODULE		CO2	CLO 15	AUSD02 15
1	When a function is continuous?	MODULE- In other words, a function f	-III Understand	CO 3	CLO 15	AHSB02.15
1	When a function is continuous?	MODULE- In other words, a function f is continuous at a point x=a,		CO 3	CLO 15	AHSB02.15
1		In other words, a function f is continuous at a point x=a, when (i) the function f is		CO 3	CLO 15	AHSB02.15
1		In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f		CO 3	CLO 15	AHSB02.15
1		In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the		CO 3	CLO 15	AHSB02.15
1		In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand		CO 3	CLO 15	AHSB02.15
1		In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal,		CO 3	CLO 15	AHSB02.15
1		In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x		CO 3	CLO 15	AHSB02.15
1	is continuous?  When a function	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal,		CO 3	CLO 15	AHSB02.15 AHSB02.15
	is continuous?	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a).	Understand	1000	V14 6	
	is continuous?  When a function	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at	Understand	1000	V14 6	
	is continuous?  When a function	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a	Understand	1000	V14 6	
	is continuous?  When a function	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of	Understand	1000	V14 6	
	is continuous?  When a function	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of the points from the left is	Understand	1000	V14 6	
	is continuous?  When a function	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of the points from the left is approaching the same value	Understand	1000	V14 6	
	is continuous?  When a function	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of the points from the left is approaching the same value as the slope of the tangent of	Understand	1000	V14 6	
2	When a function is differentiable?	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of the points from the left is approaching the same value as the slope of the tangent of the points from the right.	Understand  Remember	CO 3	CLO 15	AHSB02.15
	When a function is differentiable?	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of the points from the left is approaching the same value as the slope of the tangent of the points from the right. If a function f is defined on the	Understand	1000	V14 6	
2	When a function is differentiable?	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of the points from the left is approaching the same value as the slope of the tangent of the points from the right. If a function f is defined on the closed interval [a,b] satisfying	Understand  Remember	CO 3	CLO 15	AHSB02.15
2	When a function is differentiable?	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of the points from the left is approaching the same value as the slope of the tangent of the points from the right. If a function f is defined on the closed interval [a,b] satisfying the following conditions i) The	Understand  Remember	CO 3	CLO 15	AHSB02.15
2	When a function is differentiable?	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of the points from the left is approaching the same value as the slope of the tangent of the points from the right. If a function f is defined on the closed interval [a,b] satisfying the following conditions i) The function f is continuous on the	Understand  Remember	CO 3	CLO 15	AHSB02.15
2	When a function is differentiable?	In other words, a function f is continuous at a point x=a, when (i) the function f is defined at a, (ii) the limit of f as x approaches a from the right-hand and left-hand limits exist and are equal, and (iii) the limit of f as x approaches a is equal to f(a). A function is differentiable at a point when there's a defined derivative at that point. This means that the slope of the tangent line of the points from the left is approaching the same value as the slope of the tangent of the points from the right. If a function f is defined on the closed interval [a,b] satisfying the following conditions i) The	Understand  Remember	CO 3	CLO 15	AHSB02.15

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		there exists a value $x = c$ in such a way that				
		$f'(c) = \frac{f(b)-f(a)}{b-a}$				
4	State Lagranges theorem	Lagrange's mean value theorem (MVT) states that if a function $f(x)$ is continuous on a closed interval $[a,b]$ and differentiable on the open interval $(a,b)$ , then there is at least one point $x=c$ on this interval, such that $f(b) - f(a) = f'(c)(b-a).$	Remember	CO 3	CLO 15	AHSB02.15
5	State Cauchy's mean value theorem.	Cauchy's mean-value theorem is a generalization of the usual mean-value theorem. It states that if $f(x)$ and $g(x)$ are continuous on the closed interval $[a, b]$ , if $g(a) \neq g(b)$ , and if both functions are differentiable on the open interval $(a, b)$ , then there exists at least one $c$ with $a < c < b$ such that $\frac{f(b) - f(a)}{g(b) - g(a)} = \frac{f'(c)}{g'(c)}$	Remember	CO 3	CLO 15	AHSB02.15
6	What is geometric interpretation of Rolles theorem?	Geometric interpretation of Rolle's Theorem: Algebraically, this theorem tells us that if $f(x)$ is representing a polynomial function in $x$ and the two roots of the equation $f(x) = 0$ are $x = a$ and $x = b$ , then there exists at least one root of the equation $f'(x) = 0$ lying between the values.	Understand	CO 3	CLO 16	AHSB02.16
7	What is geometrical interpretation of Lagranges mean values?	In the given graph the curve $y = f(x)$ is continuous from $x = a$ and $x = b$ and differentiable within the closed interval $[a,b]$ then according to Lagrange's mean value theorem, for any function that is continuous on $[a,b]$ and differentiable on $(a,b)$ there exists some $c$ in the interval $(a,b)$ such that the secant joining the endpoints of the interval $[a,b]$ is parallel to the tangent at $c$ .	Remember	CO 3	CLO 16	AHSB02.16

8       When a function of CR, y) is said to be homogeneous?       Let f(x, ty) = ℓ f(x, y).       Understand       CO 3       CLO 16       AHSB02.16         9       What are triple integrals?       Integrals of a function of three variables over a region of R are called triple integrals?       Remember       CO 3       CLO 16       AHSB02.16         10       How to calculate volume using triple integral?       A double integral is used for integrating over a two-dimensional region, while and triple integral is used for integrating over a three-dimensional region, while and triple integral is used for integrating over a three-dimensional region.       Remember       CO 3       CLO 16       AHSB02.16         12       What is R in polar coordinates?       In polar coordinates, a point in the plane is determined by its distance r from the origin and the angle theta (in radians) between the line from the origin to the point and the x-axis (see the figure below). It is common to represent the point by an ordered pair (r, theta).       Remember       CO 3       CLO 17       AHSB02.17         13       What is Z in cylindrical coordinates?       In the cylindrical coordinates of the projection of P onto the x y-plane and x is the directed distance from the x y-plane to P.       Remember       CO 3       CLO 17       AHSB02.16         14       What is Cartesian and polar coordinates?       Coordinates (r, θ) to Cartesian and polar coordinates (r, θ) to convert from Polar Coordinates (r, θ) to cartesian coordinates?       Remember       CO 3       CLO	S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
be homogeneous?	8		Let $f(x, y)$ be a homogeneous	Understand	CO 3	CLO 16	AHSB02.16
bomogeneous?		-	function of order <i>n</i> so that				
9 What are triple integrals of a function of three variables over a region of R³ are called triple integrals.  10 How to calculate volume using triple integral wolume using triple integral?  11 What is difference between double and triple integral of enterprise integrating over a two-dimensional region, while a triple integral is used for integrating over a two-dimensional region, while a triple integral is used for integrating over a two-dimensional region, while a triple integral is used for integrating over a two-dimensional region.  12 What is R in polar coordinates, a point in the plane is determined by its distance r from the origin and the x-axis (see the figure below). It is common to represent the point and the x-axis (see the figure below). It is common to represent the point by an ordered pair (r. theta).  13 What is Z in cylindrical coordinates system, a point P in space is represented by the ordered triple (r, θ, z), where r and θ are polar coordinates of the projection of P onto the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane in the distance from the x-y-plane in the plane is determined by the ordered triple (r, θ, z), where r and θ are polar coordinates?  14 What is relationship between Cartesian and polar coordinates of the projection of P onto the x-y-plane in the polar coordinates?  15 What is Cartesian and polar coordinates from the point to a pair of perpendicular lines in the plane called the coordinate axes, which meet at the origin.  16 What is partial derivate?  17 What is partial derivate?  18 What is partial derivate?  19 What is partial derivate?  10 A derivate of a function of two or more variables with the content of two or more variables with the content of the policy to the content of the polic							
three variables over a region of R³ are called triple integrals.  10 How to calculate volume using triple integrals with the plane integrals.  11 What is double integral is used for integrating over a two-dimensional region, while a triple integral is used for integrals?  12 What is R in polar coordinates, a point in the plane is determined by its distance r from the origin and the angle that (in radians) between the line from the origin to the point and the x-axis (see the figure below). It is common to represent the point by an ordered pair (r, theta).  13 What is Z in cylindrical coordinates?  14 What is a tip directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane to P.  14 What is relationship between Cartesian Coordinates (x, 0) to Cartesian and polar coordinates (x, 0) to Cartesian and polar and coordinates (x, 0) to Cartesian and polar coordinates (x, 0) to Cartesian Coordinates (x, 0) to Cartesian and polar coordinates (x, 0) to Cartesian (x, 0		nomogeneous?	$f(tx, ty) = t^n f(x, y).$				
three variables over a region of R³ are called triple integrals.  10 How to calculate volume using triple integrals with the plane integrals.  11 What is double integral is used for integrating over a two-dimensional region, while a triple integral is used for integrals?  12 What is R in polar coordinates, a point in the plane is determined by its distance r from the origin and the angle that (in radians) between the line from the origin to the point and the x-axis (see the figure below). It is common to represent the point by an ordered pair (r, theta).  13 What is Z in cylindrical coordinates?  14 What is a tip directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane and z is the directed distance from the x-y-plane to P.  14 What is relationship between Cartesian Coordinates (x, 0) to Cartesian and polar coordinates (x, 0) to Cartesian and polar and coordinates (x, 0) to Cartesian and polar coordinates (x, 0) to Cartesian Coordinates (x, 0) to Cartesian and polar coordinates (x, 0) to Cartesian (x, 0	9	What are triple	Integrals of a function of	Remember	CO 3	CLO 16	AHSR02 16
of R³ are called triple integrals.  10 How to calculate volume using triple integrals griple integrals?  11 What is difference between double and triple integrals?  12 What is R in polar coordinates?  13 What is R in polar coordinates?  14 What is Z in cylindrical coordinates?  15 What is Z in relationship between Cartesian and polar relationship between Cartesian and polar coordinates?  15 What is Cartesian and polar coordinates?  16 What is Cartesian coordinates?  17 What is Cartesian coordinates?  18 What is Cartesian coordinates?  19 What is Cartesian and polar coordinates?  10 What is Cartesian coordinates?  11 What is Cartesian and polar relationship between Cartesian and polar relationship coordinates?  18 What is Cartesian coordinates?  19 What is Cartesian coordinates?  10 What is Cartesian and polar relationship between Cartesian and polar relationship coordinates?  11 What is Cartesian coordinates?  12 What is Cartesian and polar relationship between Cartesian coordinates (r, θ) to Cartesian Coordinates (r, θ) to Cartesian Coordinates?  15 What is Cartesian and polar relationship between Cartesian coordinates (r, θ) to Cartesian Coordinates?  15 What is Cartesian coordinates (r, θ) to Cartesian Coordinates (r, θ) to Cartesian Coordinates?  16 What is Cartesian relationship between Cartesian Coordinates (r, θ) to Cartesian Coordinates (r, θ				Kemember	003	CLO 10	7115002.10
10   How to calculate volume using triple integral volume using triple integral		8					
How to calculate volume using triple integral wolume using triple integral							
volume using triple integral?  If What is difference between double and triple integrals?  If what is Remember integral is used for integrating over a two-dimensional region, while a triple integral is used for integrating over a three-dimensional region.  In polar coordinates?  In polar coordinates, a point in the plane is determined by its distance r from the origin and the angle theta (in radians) between the line from the origin to the point and the x-axis (see the figure below). It is common to represent the point by an ordered pair (r, theta).  If what is Z in cylindrical coordinates?  If what is Z in relationship between and z is the directed distance from the x y-plane and z is the directed distance from the x y-plane and z is the directed distance from the x y-plane (Coordinates) (r, θ) to Cartesian and polar coordinates?  If what is Cartesian coordinates?  The x and y coordinates of a point measure the respective distances from the point to a pair of perpendicular lines in the plane called the coordinate axes, which meet at the origin.  MODULE-IV    What is partial derivate?   A derivative of a function of two or more variables with   Remember   CO 4   CLO 18   AHSB02.18   AH	10	How to calculate		Remember	CO 3	CLO 16	AHSB02.16
The line line in the line in the line in the plane is determined between double and triple integrals?   A double integral is used for integrals?   In plant coordinates?   In polar coordinates?   In the cylindrical coordinates of the projection of P onto the x y-plane and z is the directed distance from the x y-plane to P.   In the cylindrical coordinates of the projection of P onto the x y-plane and z is the directed distance from the x y-plane to P.   In the cylindrical coordinates?   In the cylindrical coordinates of the projection of P onto the x y-plane and z is the directed distance from the x y-plane to P.   In the cylindrical coordinates of the projection of P onto the x y-plane to P.   In the cylindrical coordinates of the projection of P onto the x y-plane to P.   In the cylindrical coordinates of the projection of P onto the x y-plane to P.   In the cylindrical coordinates of the projection of P onto the x y-plane to P.   In the cylindrical coordinates of the projection of P onto the x y-plane to P.   In the cylindrical coordinates of the projection of P onto the x y-plane to P.   In the cylindrical coordinates of the projection of P onto the x y-plane to P.   In the x and y coordinates of a point measure the respective distances from the point to a pair of perpendicular lines in the plane called the coordinate axes, which meet at the origin.   In the plane called the coordinate axes, which meet at the origin.   In the plane called the coordinate axes, which meet at the origin.   In the plane called the coordinates with   In the plane called the coordinate axes, which meet at the origin.   In the plane called the coordinates with   In the plane called the coordinates with   In the plane called the coordinate axes, which meet at the			1			02010	
difference between double and triple integrals?         integrating over a two-dimensional region, while a triple integral is used for integrating over a three-dimensional region.           12         What is R in polar coordinates, a point polar coordinates?         In polar coordinates, a point in the plane is determined by its distance r from the origin and the angle theta (in radians) between the line from the origin to the point and the x-axis (see the figure below). It is common to represent the point by an ordered pair (r, theta).         Remember         CO 3         CLO 17         AHSB02.17           13         What is Z in coordinates?         In the cylindrical coordinate system, a point P in space is represented by the ordered triple (r, θ, z), where r and θ are polar coordinates of the projection of P onto the x y-plane and z is the directed distance from the x y-plane and z is the directed distance from the x y-plane to P.         Remember         CO 3         CLO 16         AHSB02.16           14         What is relationship between Cartesian and polar coordinates?         Coordinates (r, θ) to Cartesian Coordinates (r, θ) to Cartesian Coordinates (r, θ) to Date of the point to a pair of perpendicular lines in the plane called the coordinate axes, which meet at the origin.         Remember         CO 3         CLO 16         AHSB02.16           MODULE-IV           1         What is partial derivate?         A derivative of a function of two or more variables with         Remember         CO 4         CLO 18         AHSB02.18		triple integral?	$\iiint_E f(x,y,z) dv$				
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14What is relationship between Cartesian and polar coordinates?to convert from Polar Coordinates $(r, \theta)$ to Cartesian Coordinates $(x, y)$ : $x = r \times \cos(\theta)$ $y = r \times \sin(\theta)$ Remember CO 3CLO 16AHSB02.1615What is Cartesian coordinate?The $x$ and $y$ coordinates of a point measure the respective distances from the point to a pair of perpendicular lines in the plane called the coordinate axes, which meet at the origin.Remember CO 3CLO 16AHSB02.16MODULE-IVWhat is partial derivate?A derivative of a function of two or more variables withRemember CO 4CLO 18AHSB02.18						700	
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coordinate?  point measure the respective distances from the point to a pair of perpendicular lines in the plane called the coordinate axes, which meet at the origin.  MODULE-IV  What is partial derivate?  A derivative of a function of two or more variables with  Remember CO 4 CLO 18 AHSB02.18	1.5		TPL 1 1' · · · · · · ·	D and 1	CO 2	CI O 16	AUGDO2 16
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derivate? two or more variables with			MODULE	-IV			
two of more variables with	1		A derivative of a function of	Remember	CO 4	CLO 18	AHSB02.18
respect to one variable, the		derivate?	two or more variables with				
			respect to one variable, the				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		other(s) being treated as				
		constant.				
2	When the	When Jacobian transformation	Remember	CO 4	CLO 18	AHSB02.18
	functions u and v	of u and v with respect to				
	are said to be	dependent variables x and y is				
	functionally dependent?	zero.				
3	What is	A stationary point of a	Remember	CO 4	CLO 18	AHSB02.18
	stationary value?	differentiable function of one				
		variable is a point on the				
		graph of the function where				
		the function's derivative is				
		zero.	_			
4	What are critical	Critical point of a single	Remember	CO 4	CLO	AHSB02.18
	points?	variable function. A critical	-	1		
		point of a function of a single real variable, $f(x)$ , is a value				
		$x_0$ in the domain of f where it is				
		not differentiable or its				
		derivative is 0 (f $'(x_0) = 0$ ).				
5	What are saddle	Saddle points are points where	Remember	CO 4	CLO	AHSB02.18
	points?	the function is neither maxima nor minima.				
6	What are	A point of a curve at which a	Remember	CO 4	CLO	AHSB02.18
	inflection points?	change in the direction of	Remember		CLO	711151502.10
	1	curvature occurs				
7	When the	$f^{1}(x)$ and equate it to zero	Remember	CO 4	CLO	AHSB02.18
	function is	Solve the above equation we get				
	maximum?					
		$X_0, X_1$ as roots.				
		Then find $f^{11}(x)$ .	_ 10			
		If $f^{11}(x)_{(x=x0)} > 0$ ,	- 41		-	
		If $f^{11}(x)_{(x=x0)} < 0$ , $f(x)$ is		7		2.
	C	maximum at x <sub>0</sub>			. `	
8	When the	$f^{l}(x)$ and equate it to zero	Remember	CO 4	CLO	AHSB02.18
	function is minimum?	Solve the above equation we get	2		100	
	minimum:	$x_0, x_1$ as roots.		- /		
		Then find $f^{11}(x)$ .		4		
			-	7		
		If $f^{11}(x)_{(x=x0)} > 0$ , then	1 1	0		
		$f(x)$ is minimum at $x_0$	1 .			
9	Write the first	f is a function x and y variable	Remember	CO 4	CLO	AHSB02.18
	order partial	then $\frac{\partial f}{\partial x}$ , $\frac{\partial f}{\partial y}$				
10	derivatives? Write the higher	f is a function x and y variable	Remember	CO 4	CLO	AHSB02.18
10	order partial	then $\frac{\partial^2 f}{\partial x^2}$ , $\frac{\partial^2 f}{\partial y^2}$ , $\frac{\partial^2 f}{\partial x \partial y}$	Remember		CLO	1110002.10
	derivatives?	, ,				
11	Explain the	If u and v are continuous and	Remember	CO 4	CLO	AHSB02.18
	jacobian of two variables?	differentiable functions of two				
	variables?	independent variables x and y				
		then the determinant $\frac{\partial x}{\partial x} = \frac{\partial y}{\partial y}$				
		$\left  \frac{\partial v}{\partial x} - \frac{\partial v}{\partial x} \right $				
		. 102 021				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
12	Explain the	If u, v,w are continuous and	Remember	CO 4	CLO	AHSB02.18
	jacobian of three	differentiable functions of two				
	variables?	independent variables x and y,z then the				
		$ \partial u - \partial u $				
		$\overline{\partial x}$ $\overline{\partial y}$ $\overline{\partial z}$				
		determinant $\begin{vmatrix} \frac{\partial v}{\partial x} & \frac{\partial v}{\partial y} & \frac{\partial v}{\partial z} \end{vmatrix}$				
		$\begin{vmatrix} \partial x & \partial y & \partial z \\ \partial w & \partial w & \partial w \end{vmatrix}$				
		$\left  \frac{\partial}{\partial x} \right  \left  \frac{\partial}{\partial y} \right  \left  \frac{\partial}{\partial z} \right $				
13	When the	When Jacobian transformation	Remember	CO 4	CLO	AHSB02.18
	functions u and v are said to be	of u and v with respect to dependent variables x and y is				
	functionally	not equals to zero.				
	independent?	not equals to zero.		_		
14	When the	The stationary point (a,b)	Remember	CO 4	CLO	AHSB02.18
	function is	satisfying maximum condition	The same of the sa			
	maximum point?	,that point of the function is				
1.5	When the	called the maximum point.	Remember	CO 4	CLO	AHSB02.18
15	function is	The stationary point (a,b) satisfying minimum condition	Kemember	CO 4	CLU	АПЗВ02.18
	minimum point?	,that point of the function is				
	<b>F</b> ·	called the minimum point.				
		MODULE	<b>-V</b>			
1	What is vector	An algebra for which the	Remember	CO 5	CLO 22	AHSB02.22
	algebra?	elements involved may				
		represent vectors and the				
		assumptions and rules are based on the behavior of vectors.				
2	Define unit	A unit vector is a vector of unit	Remember	CO 5	CLO 22	AHSB02.22
_	vector?	length.	11011101111001	000	020 22	1112202122
3	What is difference	A vector quantity has a direction	Remember	CO 5	CLO 21	AHSB02.21
	between scalar	and a magnitude, while	- 4		-	
	and vector?	a scalar has only a magnitude.	D 1	00.5	CI O 21	A 11GD 02 21
4	What is	If the product of two vectors is	Remember	CO 5	CLO 21	AHSB02.21
	difference between dot and	a scalar quantity, the product is called scalar product or dot		7		
	cross product?	product. If the product of	9		50-	
		two vectors is a vector quantity			1.6	
		then the product is called vector		2.3	0	
		product or cross product. If		1		
		two vectors are perpendicular to		0		
		each other than their scalar product is zero.	1 1 1			
5	What is vector	Vector calculus,	Understand	CO 5	CLO 22	AHSB02.22
	calculus?	or vector analysis, is a branch of				.5= 5=1==
		mathematics concerned with				
		differentiation				
	Wiles Add to the control	and integration of vector fields.	TI-do	CO 7	CI O 22	AHGDO2 22
6	What is line	Any integral that is evaluated along a curve is called a line	Understand	CO 5	CLO 23	AHSB02.23
	integral?	integral.				
7	Define unit	Let S be a two-sided surface.	Understand	CO 5	CLO 22	AHSB02.22
	normal.	Let one side of S be considered				
		arbitrarily as the positive side (if				
		S is a closed surface this is				
		taken as the outer side). A unit				
		normal n to any point of the				

S. No	QUESTION	ANSWER	<b>Blooms Level</b>	CO	CLO	CLO Code
		positive side of S is called				
		a positive or outward				
		drawn normal.				
8	What does	Green's theorem gives a	Understand	CO 5	CLO 24	AHSB02.24
	Greens theorem	relationship between the line				
	mean?	integral of a two-dimensional				
		vector field over a closed path				
		in the plane and the double integral over the region it				
		encloses.				
9	What does Stokes	a theorem proposing that the	Understand	CO 5	CLO 24	AHSB02.24
	theorem mean?	surface integral of the curl of a				
		function over any surface				
		bounded by a closed path is				
		equal to the line integral of a				
		particular vector function round	-	-		
10	What I C	that path.	II. 1	00.7	CI O 24	AHGDOGGA
10	What does Gauss divergence	The divergence theorem is a mathematical statement of the	Understand	CO 5	CLO 24	AHSB02.24
	theorem mean?	physical fact that, in the absence				
	theorem mean:	of the creation or destruction of				
		matter, the density within a				
		region of space can change only				
		by having it flow into or away				
		from the region through its				
		boundary.	_		CT 0.51	
11	What is Gradient?	Gradient of a scalar field, gives	Remember	CO 5	CLO 21	AHSB02.21
		the change per unit "distance" in the value of the field.				
12	What is	the scalar product of the	Remember	CO 5	CLO 21	AHSB02.21
12	divergence?	operator del and a given vector,	Remember	CO 3	CLO 21	711151502.21
	ur vergence .	which gives a measure of the				
		quantity of flux emanating from				_
		any point of the vector field or				
		the rate of loss of mass, heat,		-7		
- 12		etc., from it.			CT 0 41	
13	What is	In sum, the gradient is a vector	Remember	CO 5	CLO 21	AHSB02.21
	difference	with the slope of the function along each of the coordinate				
	between gradient and directional	axes whereas the			100	
	derivative?	directional derivative is		- 4	300	
		the slope in an arbitrary		6		
		specified direction.	- 4	1		
14	What is	The directional derivative is	Remember	CO 5	CLO 21	AHSB02.21
	directional	the rate at which the function				
	derivative?	changes at a point in the				
		direction. It is a vector form				
		of the usual derivative				
15	What is	In sum, the gradient is a	Remember	CO 5	CLO 21	AHSB02.21
	difference	vector with the slope of the				
	between gradient	function along each of the				
	and directional	coordinate axes whereas				
	derivative?	the directional derivative is				
		the slope in an arbitrary				
		specified direction.				

**Signature of the Faculty** 

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