SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

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DEPARTMENT OF MATHEMATICS

QUESTION BANK

I SEMESTER

(COMMON TO ALL BRANCHES)

1918102 - ENGINEERING MATHEMATICS-I

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QUESTION BANK

SUBJECT : 1918102 – Engineering Mathematics - I
YEAR /SEMESTER: I Year / I Semester B.E./ B.Tech.
(Common to all Branches)

UNIT I MATRICES

System of Equations – Consistency and inconsistency - Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Statement and application Cayley-Hamilton theorem– Reduction of a quadratic form to canonical form by orthogonal transformation.

Q.No.	Question	BT -Level	Competence
	PART-A		
1	Find the characteristic equation of A=$\begin{pmatrix} 1 & -2 \\ -5 & 4 \end{pmatrix}$	BTL-1	Remembering
2	Find the eigen values of A^2 if A=$\begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$	BTL-1	Remembering
3	If the eigen values of the matrix A of order 3X3 are 2,3 and 1, then find the determinant of A	BTL-2	Understanding
4	If the sum of 2 eigen values and the trace of a 3×3 matrix are equal, find the value of $\|A\|$	BTL-1	Remembering
5	Prove that sum of eigen values of a matrix is equal to its trace.	BTL-3	Applying
6	Prove that the eigen values of A^{-1} are $\frac{1}{\lambda_1},\frac{1}{\lambda_2},\frac{1}{\lambda_3}..........\frac{1}{\lambda_n}$	BTL-3	Applying
7	Find the sum of the eigen values of 2A, if A= $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$	BTL-3	Applying
8	The product of the 2 eigen values of A= $\begin{pmatrix} 6 & -2 & 2 \\ -3 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$ is 14. Find the 3rd eigen value.	BTL-1	Remembering
9	Find the sum and product of the eigen values of A= $\begin{pmatrix} 2 & -2 & 2 \\ -2 & -1 & -1 \\ 2 & -1 & -1 \end{pmatrix}$	BTL-1	Remembering
10	Find the sum and product of the eigen values of A= $\begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{pmatrix}$	BTL-1	Remembering
11	Find the constants a and b such that the matrix $\begin{pmatrix} a & 4 \\ 1 & b \end{pmatrix}$ has 3,-2 be the eigen values of A	BTL-4	Analyzing
12	State Cayley-Hamilton theorem.	BTL-2	Understanding
13	Write any 2 applications of Cayley Hamilton theorem	BTL-2	Understanding
14	Use Cayley Hamilton theorem to find A^{-1} if A=$\begin{pmatrix} 2 & 1 \\ 1 & -5 \end{pmatrix}$	BTL-2	Understanding
15	If A=$\begin{pmatrix} 1 & 0 \\ 4 & 5 \end{pmatrix}$ find A^3 using Cayley Hamilton theorem	BTL-2	Understanding
16	Find the matrix corresponding to the quadratic form 2xy-2yz+2xz.	BTL-4	Analyzing
17	Find the quadratic form corresponding to the matrix A= $\begin{pmatrix} 2 & 2 & 0 \\ 2 & 5 & 0 \\ 0 & 0 & 3 \end{pmatrix}$	BTL-5	Evaluating
18	Find the matrix corresponding to the quadratic form $x^2+y^2+z^2$	BTL-5	Evaluating
19	Define Index, Signature and Rank.		
20	Find the symmetric matrix A, whose eigen values are 1 and 3 with corresponding eigen vectors $\begin{pmatrix} 1 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$	BTL-6	Creating

PART-B

1	Test for the consistency of the following system of equations and solve them, if consistent $3x+y+z=8, -x+y-2z=-5, x+y+z=6, -2x+2y-3z=-7$.	BTL-5	Evaluating
2	Examine the consistency of the equations $x+y+z=3$, $2x-y+3z=4, 5x-y+7z=11$.	BTL-5	Evaluating
3	Investigate for the value of λ,μ the system of equations $x+y+z=6$, $x+2y+3z=10, x+2y+\lambda z=\mu$ have (i) Unique solution, (ii) Infinitely many solution, (iii) No solution	BTL-6	Creating
4	Find the eigen values and eigen vectors of the matrix A= $\begin{pmatrix}1 & 0 & -1\\ 1 & 2 & 1\\ 2 & 2 & 3\end{pmatrix}$	BTL-2	Understanding
5	Find the eigen values and eigen vectors of the matrix A= $\begin{pmatrix}5 & 0 & 1\\ 0 & -2 & 0\\ 1 & 0 & 5\end{pmatrix}$	BTL-2	Understanding
6	Obtain the eigen values and eigen values and eigen vectors of the matrix A= $\begin{pmatrix}3 & -1 & 0\\ -1 & 2 & -1\\ 0 & -1 & 3\end{pmatrix}$.	BTL-4	Analyzing
7	Obtain the eigen values and eigen vectors of the matrix A= $\begin{pmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{pmatrix}$	BTL-5	Evaluating
8	Find the Characteristic equation of the matrix A= $\begin{pmatrix}2 & -1 & 2\\ -1 & 2 & -1\\ 1 & -1 & 2\end{pmatrix}$ and hence find $A^{4.}$	BTL-4	Analyzing
9	Verify Cayley-Hamilton theorem and hence find A^{-1} of A= $\begin{pmatrix}1 & 0 & 3\\ 2 & 1 & -1\\ 1 & -1 & 1\end{pmatrix}$	BTL-1	Remembering
10	Verify Cayley-Hamilton theorem for the matrix A= $\begin{pmatrix}1 & 1 & 3\\ 1 & 3 & -3\\ -2 & -4 & -4\end{pmatrix}$ and also find A^{-1}.	BTL-4	Analyzing
11	Reduce the quadratic form $8x^2+7y^2+3z^2-12xy+4xz-8yz$ into canonical form by orthogonal reduction.	BTL-5	Evaluating
12	Reduce the quadratic form $6{x_1}^2+3{x_2}^2+3{x_3}^2-4x_1x_2-2x_2x_3+4x_3x_1$ into canonical form by an orthogonal reduction.	BTL-2	Understanding
13	Reduce the quadratic form $2{x_1}^2+{x_2}^2+{x_3}^2+2x_1x_2-2x_1x_3-4x_2x_3$ into canonical form by an orthogonal reduction.	BTL-1	Remembering
14	Reduce the quadratic form $2{x_1}^2+5{x_2}^2+3{x_3}^2+4x_1x_2$ into canonical form by an orthogonal reduction.	BTL-1	Remembering
	Part C		
1.	Diagonalize the matrix A= $\begin{pmatrix}7 & -2 & 0\\ -2 & 6 & -2\\ 0 & -2 & 5\end{pmatrix}$ by means of an orthogonal transformation.	BTL-6	Creating
2.	Determine the nature of the quadratic form ${x_1}^2+2{x_2}^2+{x_3}^2-2x_1x_2+2x_2x_3$ by reducing it into canonical form by orthogonal transformation	BTL-6	Creating
3.	Determine the nature of the quadratic form $2xy-2yz+2xz$ by reducing it into canonical form by orthogonal transformation	BTL-6	Creating
4.	The Eigen vectors of a $3X3$ real symmetric matrix A corresponding to the eigen values 1,2,4 are $(1, 0, 0)^T, (0, 1, 1)^T, (0, 1, -1)^T$ respectively. Find the matrix A.	BTL-6	Creating
UNIT II DIFFERENTIAL CALCULUS			
Limit of a function - Continuity – Differentiability - Differentiation rules – Roll's Theorem and Mean Value Theorem – Taylor's Series - Maxima and Minima of functions of one variable.			

Q.No.	Question	BTLevel	Domain
PART – A			
1.	Show that $\lim_{x\to 0} x^2 \sin\left(\frac{1}{x}\right) = 0$.	BTL -1	Remembering
2.	Check whether $\lim_{x\to -3} \frac{3x+9}{\lvert x+3\rvert}$ exist	BTL -4	Analyzing
3.	Find $\lim_{x\to 0} \frac{\tan x - x}{x^3}$.	BTL -2	Understanding
4.	Use the squeeze theorem to show that $\lim_{x\to 0} \sqrt{x^3+x^2}\ \sin\frac{\pi}{x} = 0$	BTL -3	Applying
5.	Predict the values of a and b so that the function f given by $f(x) = \begin{cases} 1 & if\ x \le 3 \\ ax+b & if\ \ 3 < x < 5 \\ 7 & if\ \ x \ge 5 \end{cases}$ is continuous at x=3 and x=5.	BTL -2	Understanding
6.	If the function $f(x) = \begin{cases} \frac{x^2-16}{x-4} & if\ x \ne 4 \\ c & if\ \ x = 4 \end{cases}$ is continuous, what is the value of c?	BTL -6	Creating
7.	Point out $\frac{dy}{dx}$ $, if\ y = \ln\lvert\cos(\ln x)\rvert$.	BTL -4	Analyzing
8.	Calculate $\frac{d}{dx}\left((x)^{\sqrt{x}}\right)$	BTL -3	Applying
9.	Compute $\frac{d}{dx}\left((x)^{sinx}\right)$	BTL -3	Applying
10.	Evaluate $\frac{d}{dx}\left((sinx)^{\ln x}\right)$	BTL -5	Evaluating
11.	Where the function $f(x) = \lvert x\rvert$ is differentiable?	BTL -2	Understanding
12.	Estimate $\frac{d}{dx}((sinx)^{cosx})$	BTL -2	Understanding
13.	Estimate y' if $x^3 + y^3 = 6xy$	BTL -2	Understanding
14.	Using Rolle's theorem find the value of c for the function $f(x) = \sqrt{1-x^2}, -1 \le x \le 1$	BTL -2	Understanding
15.	Verify Lagrange's law for the function $f(x) = \frac{1}{x}$, [1,2]	BTL -2	Understanding
16.	Using Rolle's theorem find the value of c for the function $f(x) = (x-a)(b-x), a \le x \le b, a \ne b$	BTL -3	Applying
17.	Verify Lagrange's law for the function $f(x) = x^3, [-2,2]$	BTL -4	Analyzing
18.	Find the Taylor's series expansion of the function $f(x) = sinx$ about the point $x = \frac{\pi}{2}$	BTL -2	Understanding
19.	Find the critical numbers of the function $f(x) = 2x^3 - 3x^2 - 36x$	BTL -3	Applying
20.	Find the critical points of $y = 5x^2 - 6x$	BTL -3	Applying
PART – B			
1.(a)	Point out the domain where the function f is continuous Also find the number at which the function f is discontinuous when $f(x) = \begin{cases} 1+x^2 & if\ \ x \le 0 \\ 2-x & if\ 0 < x \le 2 \\ (x-2)^2 & if\ \ x > 2 \end{cases}$	BTL -4	Analyzing
1. (b)	Find $\frac{dy}{dx}$ $if\ y = x^2 e^{2x}(x^2+1)^4$.	BTL -3	Applying
2.(a)	Discuss the curve $y = x^4 - 4x^3$ with respect to cancavity, points of inflection and local maxima and minima.	BTL -1	Remembering
2.(b)	Obtain $y''\ if\ x^4 + y^4 = 16$	BTL -2	Understanding

3. (a)	For what value of the constant "c" is the function "f" continuous on$(-\infty,\infty)$, $f(x)=\begin{cases} cx^2+2x; x<2 \\ x^3-cx; x\geq 2\end{cases}$	BTL -4	Analyzing
3.(b)	Find y' for $cos(xy)=1+siny$.	BTL -3	Applying
4. (a)	Find the absolute maximum and minimum of f(x)= $x-2\tan^{-1}x \quad in\ [0,4]$.	BTL -1	Remembering
4.(b)	Verify Lagrange's law for the following $f(x)=2x^3+x^2-x-1, x\in[0,2]$.	BTL -4	Analyzing
5. (a)	Find y' if $x=a\left(cos\theta+\log\tan\frac{\theta}{2}\right), y=a\ sin\theta$.	BTL -1	Remembering
5.(b)	Verify Rolle's theorem for the following $f(x)=2x^3-5x^2-4x+3, x\in\left[\frac{1}{2},3\right]$.	BTL -4	Analyzing
6. (a)	Verify Lagrange's law for the following $f(x)=2x^2-4x-3, x\in[1,4]$.	BTL -1	Remembering
6.(b)	Use second derivative test to examine the relative maxima for $f(x)=x(12-2x)^2$	BTL -4	Analyzing
7.	Find the tangent line to the equation $x^3+y^3=6xy$ at the point (3,3) and at what point the tangent line is horizontal in the first quadrant	BTL -3	Applying
8.	Find where the function $f(x)=3x^4-4x^3-12x^2+5$ is increasing and where it is decreasing. Also find the local maximum and local minimum of f(x).	BTL -3	Applying
9. (a)	Verify mean value theorem for the following $f(x)=x^3-5x^2-3x, x\in[1,3]$.	BTL -4	Analyzing
9.(b)	Find the Taylor's series expansion of $f(x)=\frac{1}{1+x}$ about x=0.	BTL -3	Applying
10.(a)	Find $\frac{dy}{dx}$,when $y=\frac{a\ cosx+b\ sinx}{b\ cosx-a\ sinx}$.	BTL -4	Analyzing
10.(b)	Verify Rolle's theorem for the following function $f(x)=sinx, 0\leq x\leq\boldsymbol{\pi}$	BTL -3	Applying
11.	If $f(x)=2x^3+3x^2-36x$, find the intervals on which it is increasing or decreasing, local maximum and minimum values of $f(x)$.	BTL -4	Analyzing
12.(a)	Find the Taylor's series expansion of $f(x)=tan^{-1}x$ about x=0.	BTL -3	Applying
12.(b)	Find $y''\ if\ x^4+y^4=16$.	BTL -2	Understanding
13.	Examine the local extreme of $f(x)=x^4+2x^3-3x^2-4x+4$. Also discuss the concavity and find the inflection points	BTL -3	Applying
14.(a)	Find $\frac{dy}{dx}$ for the following functions $e^x+e^y=e^{x+y}$.	BTL -3	Applying
14.(b)	Verify Rolle's theorem for the following $f(x)=x(x-1)(x-2), x\in[0,2]$.	BTL -3	Applying
	Part C		
1.	Find the point on the parabola $y^2=2x$ that is close to the point (1,4)	BTL -3	Applying
2.	Find the equation of tangent at a point (a, b) to the curve $xy=c^2$.	BTL -5	Evaluating
3.(a)	Apply Rolle's theorem to find points on curve $y=-1+cosx$, where the tangents is parallel to x- axis in $0\leq x\leq 2\pi$	BTL -6	Creating
3(b)	At what points on the curve $x^2-y^2=2$, the slopes of tangents are equal to 2.	BTL -5	Evaluating
4.	A cylindrical hole 4mm in diameter and 12mm deep in a metal block is rebored to increase the diameter to 4.12mm. Estimate the amount of metal removed.	BTL -6	Creating

UNIT-III FUNCTIONS OF SEVERAL VARIABLES

Partial derivatives – Total derivative -Jacobians and properties - Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers

Q.No	**Question**	**BTLevel**	**Domain**
	PART – A		

1.	If $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$, $then\ find\ x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$.	BTL -1	Remembering
2.	Find $\frac{dy}{dx}$ if $x^3+y^3=3ax^2y$	BTL -1	Remembering
3.	If $x^y + y^x = 1$, then find $\frac{dy}{dx}$.	BTL -1	Remembering
4.	Find the value of $\frac{du}{dt}$, given u= log (x + y + z) , x= e^t, $y = sint, z = cost$	BTL -2	Understanding
5.	Find the value of $\frac{du}{dt}$, given $u = x^2 + y^2, x = at^2, y = 2at$.	BTL -1	Remembering
6.	If $u = x^3y^2 + x^2y^3 where\ x = at^2 and y = 2at, then\ find \frac{du}{dt}$.	BTL -3	Applying
7.	Find $\frac{du}{dt} if u = sin\left(\frac{x}{y}\right), where x = e^t, y = t^2$	BTL -3	Applying
8.	Find $\frac{du}{dt} if u = \frac{x}{y}, where x = e^t, y = log\, t$.	BTL -2	Understanding
9.	Find $\frac{\partial r}{\partial x}, if x = r\cos\theta$ & $y = r\sin\theta$.	BTL -3	Applying
10.	Find the Jacobian $\frac{\partial(u,v)}{\partial(r,\theta)}, if x = r\cos\theta$ &$y = r\sin\theta$, $u = 2xy, v = x^2 - y^2$ without actual substitution.	BTL -4	Analyzing
11.	If $u = \frac{y^2}{2x} and v = \frac{x^2+y^2}{2x}, find \frac{\partial(u,v)}{\partial(x,y)}$.	BTL -3	Applying
12.	If $\boldsymbol{x = uv, y = \frac{u}{v}. Find \frac{\partial(x,y)}{\partial(u,v)}}$.	BTL -1	Remembering
13.	If $x = u^2 - v^2, y = 2uv$ find the Jacobian of x, y with respect to u and v	BTL -2	Understanding
14.	If u = $\frac{x+y}{1-xy} and v = tan^{-1}x + tan^{-1}y, find \frac{\partial(u,v)}{\partial(x,y)}$	BTL -3	Applying
15.	Find the Taylor series expansion of x^y near the point $(1, 1)$ up to first term	BTL -2	Understanding
16.	Expand $xy + 2x - 3y + 2 in\ powers\ of\ (x - 1)$&$(y + 2)$, using Taylor's theorem up to first degree form	BTL -3	Applying
17.	Find the Stationary points of $f(x, y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$.	BTL -4	Analyzing
18.	Find the Stationary points of $x^2 - xy + y^2 - 2x + y$.	BTL -4	Analyzing
19.	State the Sufficient condition for $f(x, y)$ to be extremum at a point	BTL -4	Analyzing
20.	Find the minimum point of $f(x, y) = x^2 + y^2 + 6x + 12$.	BTL -4	Analyzing
	PART – B		
1.(a)	Find $\frac{du}{dx}$ if u = log $(x^2 + y^2) + tan^{-1}\left(\frac{y}{x}\right)$,	BTL -2	Understanding
1.(b)	If $u = \frac{yz}{x}, v = \frac{zx}{y} and w = \frac{xy}{z}, find \frac{\partial(u,v,w)}{\partial(x,y,z)}$.	BTL -3	Analyzing
2.(a)	Find the Jacobian of $\frac{\partial(x,y,z)}{\partial(r,\theta,\varphi)}$ of the transformation $x = rsin\theta cos\varphi, y = rsin\theta sin\varphi, z = rcos\theta$	BTL -2	Understanding
2.(b)	Expand $x^3y^2 + 2x^2y + 3xy^2$ in powers of (x+2) and (y-1) using Taylor's series up to third degree terms	BTL -3	Applying
3.(a)	If $u = f(x - y, y - z, z - x)$, $then\ show\ that$ $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$	BTL -4	Analyzing
3.(b)	$If x + y + z = u, y + z = uv, z = uvw$, prove that $\frac{\partial(x,y,z)}{\partial(u,v,w)} = u^2v$	BTL -2	Understanding
4. (a)	Find $\frac{du}{dx}$ if $u = cos(x^2 + y^2)$ and $a^2x^2 + b^2y^2 = c^2$	BTL -4	Analyzing
4.(b)	A flat circular plate is heated so that the temperature at any point (x, y) is $u(x, y) = x^2 + 2y^2 - x$. Find the coldest point on the plate	BTL -3	Analyzing
5.	Find the shortest distance from the origin to the hyperbola $x^2 + 8xy + 7y^2 = 225$	BTL -4	Applying
6. (a)	If $u = x + y + z, u^2v = y + z\ and\ u^3w = z$ Show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = \frac{1}{u^5}$	BTL -3	Analyzing
6.(b)	If $u = f(2x - 3y, 3y - 4z, 4z - 2x)$, then	BTL -3	Analyzing

	find $\frac{1}{2}\frac{\partial u}{\partial x}+\frac{1}{3}\frac{\partial u}{\partial y}+\frac{1}{4}\frac{\partial u}{\partial z}$		
7. (a)	Find the extreme values of $f(x,y)=x^3+y^3-3x-12y+20$.	BTL -3	Analyzing
7. (b)	Expand $e^x\, log(1+y)$ in powers of x & y up to terms of third-degree using Taylor's series	BTL -2	Understanding
8.	Discuss the maxima and minima of $f(x,y)=\ x^3y^2(1-\ x\ -\ y)$.	BTL -1	Remembering
9. (a)	Expand $tan^{-1}\frac{y}{x}$ in the neighborhood of (1, 1) as Taylor's series up to second degree terms.	BTL -3	Applying
9.(b)	Find the Maximum value of $x^my^nz^p when\ x+y+z=a$.	BTL -3	Applying
10.(a)	Find the Taylors series expansion of $e^x\ siny$ at the point (-1, $\frac{\pi}{4}$) up to the second-degree terms	BTL -4	Applying
10.(b)	Find the extreme value of $x^2+y^2+z^2$ subject to the condition $x+y+z=3a$.	BTL -2	Understanding
11.(a)	Expand e^{xy} in powers of $(x-1)$ and $(y-1)$ upto second degree terms by Taylor's series	BTL -4	Applying
11.(b)	Examine $f(x,y)=x^3+3xy^2-15x^2+72x$ for extreme values	BTL -2	Understanding
12.(a)	Expand Taylor's series of $x^3+y^3+xy^2$ in powers of $(x\ -1)$ and $(y-2)$ up to the second-degree terms.	BTL -5	Evaluating
12.(b)	If $u=xyz, v=x^2+y^2+z^2\ and\ w=x+y+z$ then find $\frac{\partial(x,y,z)}{\partial(u,v,w)}$	BTL -3	Applying
13.	Find the shortest and longest distances from the point (1,2,-1) to the sphere $x^2+y^2+z^2=24$	BTL -3	Applying
14.	Find the dimension of the rectangular box without a top of maximum capacity, whose surface area is 108 sq. cm.	BTL -3	Applying
	Part C		
1.	Divide the number 24 into three parts such that the continued product of the first, square of the second and the cube of the third may be maximum	**BTL -6**	Creating
2.	The temperature at any point (x,y,z) in space is given by $T=kxyz^2$, where k is constant. Find the height temperature on the surface of the sphere $x^2+y^2+z^2=a^2$	**BTL -5**	Evaluating
3.	A rectangular box open at the top is to have a volume 32cc. Find the dimensions of the box that requires the least for its construction.	**BTL -4**	Applying
4.	Find the volume of the greatest rectangular parallelepiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$.	**BTL -3**	Applying

UNIT IV INTEGRAL CALCULUS

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration by partial fraction, - Improper integrals.

Q.No	Question	BTLevel	Domain
	PART - A		
1.	Prove that the following integral by interpreting each in terms of areas $\int_a^b xdx=\frac{b^2-a^2}{2}$	BTL -1	Remembering
2.	State fundamental theorem of calculus	BTL -1	Remembering
3.	Evaluate $\int_0^1\sqrt{1-x^2}dx$ interms of areas.	BTL -5	Evaluating
4.	If f is continuous and $\int_0^4 f(x)dx=10,$ find $\int_0^2 f(2x)dx$	BTL -5	Evaluating
5.	Evaluate the integral $\int_a^b xdx$ by using Riemann sum method	BTL -5	Evaluating
6.	Calculate $\int\frac{x^3}{\sqrt{4+x^2}}$ dx	BTL -3	Applying

7.	Calculate $\int \sqrt{1+x^2}x^5 dx$	BTL -3	Applying
8.	Find $\int \sqrt{2x+1}\, dx$	BTL -3	Applying
9.	Find $\int \frac{x}{\sqrt{1-4x^2}}$ dx	BTL -3	Applying
10.	Evaluate $\int_0^1 \tan^{-1} x\, dx$	BTL -5	Evaluating
11.	Calculate $\int \frac{(lnx)^2}{x} dx$	BTL -3	Applying
12.	Calculate $\int (\log x)^2\, dx$	BTL -3	Applying
13.	Evaluate $\int_0^1 \frac{dx}{(1+\sqrt{x})^4}$	BTL -2	Understanding
14.	Evaluate $\int_0^{\frac{\pi}{2}} \frac{1}{1+tanx}\, dx$	BTL -5	Evaluating
15.	Evaluate $\int_4^\infty \frac{1}{\sqrt{x}}\, dx$ and determine whether it is convergent or divergent.	BTL -5	Evaluating
16.	Evaluate $\int_0^1 e^{-x^2}\, dx$	BTL -5	Evaluating
17.	Estimate $\int_1^3 \sqrt{x^2+3}dx$	BTL -5	Evaluating
18.	Evaluate the improper integral $\int_2^3 \frac{dx}{\sqrt{3-x}}$, if possible.	BTL -5	Evaluating
19.	Find $\int_2^5 \frac{dx}{\sqrt{x-2}}$	BTL -3	Analyzing
20.	Prove that $\int_1^\infty \frac{1}{x}$ dx is divergent.	BTL -1	Remembering
PART -B			
1.(a)	Evaluate $\int \frac{(lnx)^2}{x^2} dx$	BTL -5	Evaluating
1. (b)	Calculate $\int \frac{1}{\sqrt{a^2-x^2}} dx$, by using trigonometric substitution.	BTL -3	Applying
2.	Find $\int x^3 \sqrt{9-x^2}dx$ by trigonometric substitution.	BTL -3	Applying
3.	Evaluate $\int_0^{\pi/2} \frac{sinx\ cosx}{cos^2x+3cosx+2} dx.$	BTL -5	Evaluating
4.	Evaluate $\int e^{ax} \cos bx\, dx$ using integration by parts	BTL -3	Applying
5.	Evaluate $\int e^{ax} \sin bx\, dx, a > 0$ using integration by parts.	BTL -3	Applying
6. (a)	Prove that $\int tan^n x\, dx = \frac{tan^{n-1}x}{n-1}$ -$\int tan^{n-2}x\, dx\ (n \neq 1)$.	BTL -5	Evaluating
6.(b)	Find $\int \frac{sec^2x}{tan^2x+3tanx+2}\, dx$	BTL -3	Applying
7.	Evaluate $\int xtan^{-1}x\, dx$	BTL -3	Applying
8.(a)	Calculate by partial fraction $\int \frac{x^2+1}{(x-3)(x-2)^2}\, dx$	BTL -3	Applying
8.(b)	Evaluate $\int \frac{\tan x}{\sec x+\cos x}\, dx$	BTL -5	Evaluating
9. (a)	Evaluate$\int \frac{xe^{2x}}{(1+2x)^2} dx$	BTL -5	Evaluating
9.(b)	Calculate using partial fraction $\int \frac{10}{(x-1)(x^2+9)} dx$	BTL -3	Applying
10.(a)	Evaluate $\int sin^6 x cos^3 x\, dx.$	BTL -5	Evaluating
10.(b)	For what values of p is $\int_1^\infty \frac{1}{x^p} dx$ convergent?	BTL -5	Evaluating
11.(a)	Evaluate $\int_0^{\pi/2} sin^7 x\ cos^5 x\ dx$	BTL -5	Evaluating
11.(b)	Evaluate $\int_0^{\frac{\pi}{2}} cos^5\, x\, dx$	BTL -6	Creating
12.	Prove the reduction formula $\int sin^n x dx = -\frac{1}{n} sin^{n-1}x\ cosx + \frac{n-1}{n}\int sin^{n-2}x\ dx.$	BTL -1	Remembering
13.	Prove the reduction formula	BTL -1	Remembering

	$\int cos^n x dx = \frac{1}{n} cos^{n-1} x sinx + \frac{n-1}{n} \int cos^{n-2} x\, dx$		
14.	Prove that $\int sec^n x dx = \frac{tanx\, sec^{n-2} x}{n-1} + \frac{n-2}{n-1} \int sec^{n-2} x dx$ (n≠1)	BTL -1	Remembering
	Part C		
1.	The region enclosed by the circle $x^2 + y^2 = a^2$ is divided into two segments by the line x =h. Find the area of the smaller segment	BTL -5	Evaluating
2.	Find the area of the region bounded between the parabola $y^2 = 4ax$ and its latus rectum	BTL -6	Creating
3.	Let A be the area of the region that lies under the graph of $f(x)=x^3$ between x=0 and x=1 (i)Using right end points, Find an expression for A as a limit (ii)Estimate the area by taking the sample points to be midpoints and using four subintervals.	BTL -5	Evaluating
4.	Let A be the area of the region that lies under the graph of $f(x) = 1 + x^2$ between $x = -1$ and $x = 2$. Estimate the area by taking the sample points to be mid-point (i)using three subintervals and(ii) using six subintervals.	BTL -6	Creating

UNIT V MULTIPLE INTEGRALS

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves Change of variables in double integrals (Polar coordinates) – Triple integrals – Volume of solids

Q.No	Question	BT Level	Domain
	PART - A		
1.	Evaluate $\int_2^3 \int_1^2 \frac{dxdy}{xy}$	BTL -5	Evaluating
2.	Evaluate $\int_0^{\pi} \int_0^{sin\theta} r dr d\theta$	BTL -2	Understanding
3.	Find the area bounded by the lines $x = 0, y = 1\ and y = x$	BTL -2	Understanding
4.	Evaluate $\int_0^{\pi} \int_0^{a} r dr d\theta$	BTL -2	Understanding
5.	Evaluate $\int_0^5 \int_0^2 (x^2 + y^2) dxdy$	BTL -2	Understanding
6.	Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} dydx$	BTL -2	Understanding
7.	Evaluate $\int_1^{ln8} \int_0^{lny} e^{x+y}\, dxdy$	BTL -2	Understanding
8.	Evaluate $\int_0^{\pi} \int_0^5 r^4 sin\theta dr d\theta$	BTL -2	Understanding
9.	Evaluate $\int_0^2 \int_0^x \frac{dxdy}{x^2+y^2}$	BTL -2	Understanding
10.	Evaluate $\int\int dxdy$ over the region bounded by $x = 0, x = 2$, $y = 0\ and y = 2$	BTL -2	Understanding
11.	Change the order of integration $\int_0^1 \int_{y^2}^{y} f(x,y)\, dxdy$	BTL -2	Understanding
12.	Change the order of integration $\int_0^{\infty} \int_x^{\infty} f(x,y)\, dxdy$	BTL -2	Understanding
13.	Find the limits of integration in the double integral $\iint_R f(x,y) dxdy$ where R is in the first quadrant and bounded x=1, y=0, $y^2 = 4x$	BTL -4	Applying
14.	Evaluate $\int\int\int (x + y + z)\, dxdydz$ over the region bounded by $x = 0, x = 1 , y = 0\ and y = 1, z = 0, z = 1$	BTL -4	Applying
15.	Write down the double integral to find the area of the circles $r = 2sin\theta, r = 4sin\theta$	BTL -4	Applying
16.	Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy\,(x + y) dydx$	BTL -3	Analyzing
17.	Evaluate $\int_0^1 \int_0^{x^2} (x^2 + y^2) dydx$	BTL -2	Understanding
18.	Evaluate $\int_1^3 \int_3^4 \int_1^4 \int xyz\, dzdydx$	BTL -2	Understanding
19.	Evaluate $\int_0^1 dx \int_0^2 dy \int_0^3 (x + y + z) dz$	BTL -1	Remembering
20.	Evaluate $\int_a^b \int_c^d \int_f^g e^{x+y+z} dzdydx$	BTL -2	Understanding

PART B			
1.(a)	Evaluate $\iint xydxdy$ over the positive quadrant of the circle $x^2 + y^2 = a^2$	BTL -4	Applying
1. (b)	Change the order of integration $\int_0^2 \int_0^{\sqrt{4-y^2}} xy\,dxdy$ and hence evaluate it	BTL -2	Understanding
2.	Using double integral find the area of the Ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.	BTL -4	Applying
3.	Change the order of integration $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} xydxdy$ and hence evaluate it	BTL -2	Understanding
4.	Change the order of integration $\int_0^1 \int_y^{2-y} xy\ dxdy$ and hence evaluate it	BTL -3	Analyzing
5.	By changing in to polar Co – ordinates, evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\,dxdy$. Hence find the value of $\int_0^\infty e^{-x^2}\,dx$.	BTL -3	Analyzing
6.	Change the order of integration $\int_0^\infty \int_0^\infty \frac{e^{-y}}{y} dydx$ and hence evaluate it	BTL -4	Applying
7.	Find the volume of the tetrahedron bounded by the coordinate planes and $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$.	BTL -1	Remembering
8.	By change the order of integration and evaluate $\int_0^2 \int_{x^2}^{2-x} xy\ dydx$	BTL -2	Understanding
9. (a)	Find the area included between the curves $y^2 = 4x$ and $x^2 = 4y$	BTL -3	Analyzing
9.(b)	Evaluate $\int_1^e \int_1^{logy} \int_1^{e^x} logz\ dzdydx$	BTL -2	Understanding
10.(a)	Change the integral into polar coordinates $\int_0^a \int_0^x \frac{x^3}{\sqrt{x^2+y^2}} dxdy$ and hence evaluate it	BTL -2	Understanding
10.(b)	Find the area common to the cardioids $r = a(1+cos\theta)$ and $r = a\,(1-cos\theta)$	BTL -2	Understanding
11.	Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dxdydz}{\sqrt{1-x^2-y^2-z^2}}$	BTL -2	Understanding
12.	Find the value of $\iiint xyz\ dxdydz$ through the positive spherical octant for which $x^2+y^2+z^2 \le a^2$.	BTL -2	Understanding
13.	Find the volume bounded by the cylinder $x^2+y^2=1$ and the planes $x+y+z=3\,, z=0$	BTL -5	Evaluating
14.(a)	Evaluate $\int_0^a \int_0^b \int_0^c (x^2+y^2+z^2)dxdydz$	BTL -6	Creating
14.(b)	Find the area which is inside the circle $r = 3a\ cos\theta$ and outside the cardioid $r = a\,(1+ cos\theta\,)$.	BTL -2	Understanding
	Part C		
1.	Find the area bounded by parabola $y = x^2$ and straight line $2x - y + 3 = 0$.	BTL -5	Evaluating
2.	Find the volume of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$	BTL -6	Creating
3.	Find the volume of finite region of space (tetra-hadron) bounded by the planes $x=0, y=0, z=0\ and\ 2x+3y+4z=12$	BTL -5	Evaluating
4.	Find the volume of sphere bounded by $x^2+y^2+z^2=a^2$.	BTL -6	Creating