SREENIVASA INSTITUTE of TECHNOLOGY and MANAGEMENT STUDIES
(AUTONOMOUS)

# (ALGEBRA & CALCULUS)

# QUESTION BANK

I- B.TECH / I - SEMESTER REGULATION: R20


COMPILED BY
DEPARTMENT OF MATHEMATICS

# SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES

**(Autonomous)**

**DEPARTMENT of SCIENCE AND HUMANITIES**

QUESTION BANK — ALGEBRA & CALCULUS (**20BSC111**)

**ASSIGNMENT - I**

| Question No. | Questions | BLOOMS TAXONOMY |
|---|---|---|
| | **UNIT – 1: MATRICES** | |
| | **PART-A (Two Marks Questions)** | |
| **1.** | Define the rank of the matrix | **L1** |
| **2.** | Define Echelon form matrix with suitable example | **L1** |
| **3.** | Define Normal form matrix with suitable example | **L1** |
| **4.** | Find the rank of the matrix $\begin{bmatrix} -1 & 0 & 6 \\ 3 & 6 & 1 \\ -5 & 1 & 3 \end{bmatrix}$ | **L1,L2,L3** |
| **5.** | Find the rank of the matrix $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ | **L1,L2,L3** |
| **6.** | Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$ | **L1,L2,L3** |
| **7.** | Write the process in Gauss Elimination method | **L1** |
| **8.** | Define Eigen values and Eigen vectors | **L1** |
| **9.** | Write the Characteristic Equation of $\begin{bmatrix} 1 & 1 \\ 2 & 5 \end{bmatrix}$ | **L1,L2,L3** |
| **10.** | Write the Eigen values of $\begin{bmatrix} 8 & -4 \\ 2 & 2 \end{bmatrix}$ | **L1,L2,L3** |
| **11.** | Write the Characteristic Equation of the matrix A= $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 9 \end{bmatrix}$ | **L1,L2,L3** |
| **12.** | What are the eigen values of A= $\begin{bmatrix} 1 & -2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 9 \end{bmatrix}$ | **L1,L2,L3** |
| **13.** | If the Eigen values of A are 1,-2,3 then eigen values of $A^{-1}$ are? | **L1,L2,L3** |
| **14.** | If the Eigen values of A are 3,4 then Eigen values of $A^3$ are? | **L1,L2,L3** |
| **15.** | Find the eigen values of $A^{-1}$ Where A= $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & 7 \end{bmatrix}$ | **L1,L2,L3** |
| **16.** | State the Cayley Hamilton Theorem | **L1** |
| **17.** | If the Characteristic equation of A is $\lambda^3 - \lambda^2 + 3\lambda - 1 = 0$ then $A^{-1}$ is? | **L1,L2,L3** |
| **18.** | Find $A^{-1}$, when the characteristic equation of the matrix A is $A^2 - 5A + 7I=0$ | **L1,L2,L3** |
| **19.** | Define Diagonalisable matrix | **L1** |
| **20.** | Define Modal matrix | **L1** |

QUESTION BANK ALGEBRA & CALCULUS (20BSC111)

| Question No. | Questions | BLOOMS TAXONOMY |
|---|---|---|
| | **UNIT – 1 MATRICES** | |
| | **PART-B (Ten Marks Questions)** | |
| **1.** | Find the rank of the following matrix, by reducing into the echelon form $\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$ | **L1,L2,L3** |
| **2.** | Find the rank of the following matrix, by reducing into the echelon form $\begin{bmatrix} -1 & -3 & 3 & -1 \\ 1 & 1 & -1 & 0 \\ 2 & -5 & 2 & -3 \\ -1 & 1 & 0 & 1 \end{bmatrix}$ | **L1,L2,L3** |
| **3.** | Reduce the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 2 & 6 & 5 \end{bmatrix}$ to normal form and hence find the rank. | **L1,L2,L3** |
| **4.** | Reduce the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ to normal form and hence find the rank. | **L1,L2,L3** |
| **5.** | Solve $x+2y+z=4$, $2x-y+3z=9$, $3x-y-z=2$ by Gauss-Elimination method | **L1,L2,L3** |
| **6.** | Solve the system $x-y+z=2, 3x-y+2z=-6, 3x+y+z=-18$ by Gauss-Elimination method | **L1,L2,L3** |
| **7.** | Show that the system $x+y+z=6, x+2y+3z=14, x+4y+7z=30$ is consistent and solve them | **L1,L2,L3** |
| **8.** | Solve $4x+2y+z+3w=0$, $6x+3y+4z+7w=0$, $2x+y+w=0$ by Gauss-Elimination method | **L1,L2,L3** |
| **9.** | Investigate for what values of a & b the equations $x+y+z=6$, $x+2y+3z=10$, $x+2y+az=b$ have i) Unique solution ii) Infinite solutions iii) No solution | **L1,L2,L3** |
| **10.** | Find the Eigen values & Eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ | **L1,L2,L3** |

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| **11.** | Find the Eigen values & Eigen vectors of the matrix $\begin{bmatrix} 3 & -4 & 3 \\ 1 & 0 & 1 \\ 1 & 2 & -1 \end{bmatrix}$ | **L1,L2,L3** |
| **12.** | Find the Eigen values & Eigen vectors of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ | **L1,L2,L3** |
| **13.** | Verify Cayley – Hamilton theorem and hence find the $A^{-1}$ and $A^4$ where $A = \begin{bmatrix} 1 & -2 & 2 \\ 1 & -2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$ | **L1,L2,L3** |
| **14.** | Verify Cayley – Hamilton theorem and hence find the $A^{-1}$ and $A^4$ where $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ | **L1,L2,L3** |
| **15.** | Diagonalize the matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ | **L1,L2,L3** |



| Question No. | Questions | BLOOMS TAXONOMY |
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| | **UNIT – 2: DIFFERENTIAL CALCULUS AND ITS APPLICATIONS** | |
| | **PART-A (Two Marks Questions)** | |
| **1.** | State Rolle's theorem | **L1** |
| **2.** | State Lagrange's mean value theorem | **L1** |
| **3.** | Discuss the applicability of Rolle's theorem for $f(x) = 1/x^3$ on [-3,3] | **L1,L2** |
| **4.** | What is c value in Rolle's theorem for $f(x) = x^2$ on [-1,1] | **L1,L2** |
| **5.** | Discuss the applicability of Role's theorem for $f(x)=x^2$ on {0,2] | **L1,L2** |
| **6.** | State Meclaurin's series for f(x) | **L1** |
| **7.** | State Taylor's series for f(x) about x=a | **L1** |
| **8.** | Find Meclaurin's series for $f(x) = e^x$ | **L1,L2** |
| **9.** | Find Meclaurin's series for f(x) = cos x | **L1,L2** |
| **10.** | Find Meclaurin's series for f(x) = sin x | **L1,L2** |
| **11.** | Find Meclaurin's series for f(x) = sinh x | **L1,L2** |
| **12.** | Find Meclaurin's series for f(x) = cosh x | **L1,L2** |
| **13.** | Find Meclaurin's series for f(x) = log (1+x) | **L1,L2** |
| **14.** | Obtain the Taylors Series Expansion of $e^x$ about x= -1 | **L1,L2** |

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| **15.** | Define Jacobian function | **L1** |
| **16.** | $if \quad x = r\cos\theta, y = r\sin\theta, \text{ find } \frac{\partial(x,y)}{\partial(r,\theta)}$ | **L1,L2** |
| **17.** | Define Mecalurins series for f(x,y) | **L1** |
| **18.** | Define Taylor series for f(x,y) | **L1** |
| **19.** | Find the Stationary points of $x^2 + y^2 + 6x + 12$ | **L1,L2** |
| **20.** | What is the process in Lagrange's method of undetermined multipliers | **L1** |

| Question No. | Questions | BLOOMS TAXONOMY |
|---|---|---|
| | **UNIT – 2: DIFFERENTIAL CALCULUS AND ITS APPLICATIONS** | |
| | **PART-B (Ten Marks Questions)** | |
| **1.** | Verify Roll's theorem for $f(x) = e^x(\sin x - \cos x)$ $on$ $\left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$ | **L1,L2,L3** |
| **2.** | Verify Roll's theorem for $f(x) = (x-a)^m(x-b)^n on\ [a,b]\ b > a; m\&n \in Z^+$ | **L1,L2,L3** |
| **3.** | Verify Roll's theorem for $f(x) = x(x+3)e^{-\frac{x}{2}}$ on[-3,0] | **L1,L2,L3** |
| **4.** | Show that $\frac{b-a}{1+b^2} < tan^{-1}b - tan^{-1}a < \frac{b-a}{1+a^2}$ , a<b and deduce $\frac{\pi}{4} + \frac{3}{25} < tan^{-1}(4/3) < \frac{\pi}{4} + \frac{1}{6}$ | **L1,L2,L3** |
| **5.** | Show that $\frac{b-a}{\sqrt{1-a^2}} < sin^{-1}b - sin^{-1}a < \frac{b-a}{\sqrt{1-b^2}}$ , a<b<1 | **L1,L2,L3** |
| **6.** | Expand log(1+ $e^x$) is ascending powers of x | **L1,L2,L3** |
| **7.** | Obtain the Taylor's series expansion of sin x in powers of $x - \frac{\pi}{4}$ | **L1,L2,L3** |
| **8.** | Expand $f(x,y) = x^2 + xy + y^2$ in powers of (x-1) and (y-2) using Taylor's series | **L1,L2,L3** |
| **9.** | If $x$ + y + z = u, y + z = uv, z = u v w then evaluate $\frac{\partial(x,y,z)}{\partial(u,v,w)}$ . | **L1,L2,L3** |
| **10.** | If $u = \frac{yz}{x}; v = \frac{zx}{y}; w = \frac{xy}{z}, showthat \frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$ | **L1,L2,L3** |
| **11.** | Prove that u = $x$ + y + z , v = $x$y + yz+ z$x$, w = $x^2+y^2+z^2$ are functionally dependent and find the relation between them. | **L1,L2,L3** |
| **12.** | Find the maximum and minimum values of $x^3 + y^3 - 3axy, a > 0$ | **L1,L2,L3** |
| **13.** | A rectangular box open at the top has a capacity of 32 cubic feet. Find the dimensions of the box requiring least material for its construction | **L1,L2,L3** |
| **14.** | Find the volume of the largest rectangular parallelepiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ | **L1,L2,L3** |
| **15.** | Examine the function for extreme values f($x$, y)= $x^4 + y^4 - 2x^2 + 4xy - 2y^2$ | **L1,L2,L3** |

| Question No. | Questions | BLOOMS TAXONOMY |
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| | **UNIT – 3: MULTIPLE INTEGRALS** | |
| | **PART-A (Two Marks Questions)** | |
| **1.** | Evaluate $\int_0^3\int_0^5 (x+y)dydx$ | **L1,L2,L3** |
| **2.** | Evaluate $\int_0^3\int_0^2 (x+y)^2 dxdy$ | **L1,L2,L3** |

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| **3.** | Evaluate $\int_0^2 \int_0^3 dydx$ | **L1,L2,L3** |
| **4.** | Evaluate $\int_0^3 \int_0^{-2} xydxdy$ | **L1,L2,L3** |
| **5.** | Evaluate $\int_0^1 \int_0^1 x^2 y^3 dxdy$ | **L1,L2,L3** |
| **6.** | Evaluate $\int_0^1 \int_0^x e^{x+y}$dydx | **L1,L2,L3** |
| **7.** | Evaluate $\int_0^{\pi/2} \int_{-1}^1 x^2 y^2$ dxdy | **L1,L2,L3** |
| **8.** | Evaluate $\int_{-1}^2 \int_{x^2}^{x+2} dydx$ | **L1,L2,L3** |
| **9.** | Evaluate $\int_0^5 \int_0^{x^2} (x^2 + y^2)$ dy dx | **L1,L2,L3** |
| **10.** | Evaluate $\int_0^1 \int_0^1 \frac{dxdy}{\sqrt{1-x^2}\sqrt{1-y^2}}$ | **L1,L2,L3** |
| **11.** | Evaluate $\int_0^\pi \int_0^{asin\theta} rdrd\theta$ | **L1,L2,L3** |
| **12.** | Evaluate $\int_0^\infty \int_0^{\pi/2} e^{-r}$ d$\theta$dr | **L1,L2,L3** |
| **13.** | Find the limits of integration of $\iint xy$ dydx over the region in first Quadrant bounded by circle $x^2+y^2=1$ | **L1,L2,L3** |
| **14.** | What is the process for evaluation of double integral by Changing the order of integration | **L1,L2,L3** |
| **15.** | What is the process for evaluation of double integral Changing of Cartesian to polar system | **L1,L2,L3** |
| **16.** | Evaluate $\int_{-1}^1 \int_{-2}^2 \int_{-3}^3 dxdydz$ | **L1,L2,L3** |
| **17.** | Evaluate $\int_0^1 \int_0^2 \int_0^3 ydxdydz$ | **L1,L2,L3** |
| **18.** | Evaluate $\int_0^1 \int_0^1 \int_0^1 xdxdydz$ | **L1,L2,L3** |
| **19.** | Evaluate $\int_0^1 \int_1^2 \int_1^3 xyzdxdydz$ | **L1,L2,L3** |
| **20.** | Evaluate $\int_0^1 \int_1^2 \int_2^3 (x+y+z)dxdy\,dz$ | **L1,L2,L3** |
| | **PART-B (Ten Marks Questions)** | |
| **1.** | Evaluate $\int_0^5 \int_0^{x^2} x(x^2+y^2)dx\,dy$ | **L1,L2,L3** |
| **2.** | Evaluate $\int_0^a \int_0^{\sqrt{a^2-y^2}} \sqrt{a^2-x^2-y^2}$ dx.dy | **L1,L2,L3** |
| **3.** | Evaluate $\int_a^{2a} \int_0^{\sqrt{2ax-x^2}}$ xy dy dx | **L1,L2,L3** |

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| **4.** | Evaluate $\int_0^1 \int_0^{\sqrt{1+X^2}} \frac{dydx}{1+x^2+y^2}$ | **L1,L2,L3** |
| **5.** | Find $\iint (x+y)^2\,dxdy$ over the area bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ | **L1,L2,L3** |
| **6.** | Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)\,dx\,dy\,dz$ | **L1,L2,L3** |
| **7.** | Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz\,dz\,dy\,dx$ | **L1,L2,L3** |
| **8.** | Evaluate $\int_0^{\pi} \int_0^{a(1+\cos\theta)} r\,dr\,d\theta$ | **L1,L2,L3** |
| **9.** | Evaluate $\int_0^{\frac{\pi}{4}} \int_0^{a\sin\theta} \frac{r\,dr\,d\theta}{\sqrt{a^2-r^2}}$ | **L1,L2,L3** |
| **10.** | Evaluate $\iint_R xy\,dxdy$ where R is the region bounded by X-axis, x=2a and the curve $x^2 = 4ay$ | **L1,L2,L3** |
| **11.** | Change the order of integration and solve $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2\,dy\,dx$ | **L1,L2,L3** |
| **12.** | Evaluate the following integral by transforming into polar coordinates $\int_0^{\infty}\int_0^{\infty} e^{-(x^2+y^2)}\,dx\,dy$ | **L1,L2,L3** |
| **13.** | Change the order of integration $\int_0^1 \int_{x^2}^{2-x} xy\,dx\,dy$ and hence evaluate the double integral | **L1,L2,L3** |
| **14.** | Change the order of integration and solve $\int_0^a \int_{\frac{x^2}{a}}^{2a-x} xy^2\,dx\,dy$ | **L1,L2,L3** |
| **15.** | Evaluate $\iiint_V (x^2+y^2+z^2)\,dz\,dy\,dx$ where V is the volume of the cube bounded by x=0,y=0,z=0,x=a,y=b,z=c | **L1,L2,L3** |

| **Question No.** | **Questions** | **BLOOMS TAXONOMY** |
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| | **UNIT – 4: VECTOR DIFFERENTIATION** | |
| | **PART-A (Two Marks Questions)** | |
| **1.** | Find $grad\ f$ of the function $f = x^2 - y^2 + 2z^2$ | **L1,L2,L3** |
| **2.** | Find $grad\ f$ of the function $f = xy^2 + yz^2 + zx^2$ | **L1,L2,L3** |
| **3.** | Find a normal vector to the surface $x^2+y^2+2z^2 = 26$ at the point $(2,2,3)$ | **L1,L2,L3** |
| **4.** | What is Solenoidal vector? | **L1** |
| **5.** | What is divergence of a vector? | **L1** |

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| **6.** | What is Curl of a vector? | **L1** |
| **7.** | What is Irrotational vector? | **L1** |
| **8.** | Find $div\ \bar{f}$ where $\bar{f} = x^2i + y^2j + z^2k$ | **L1,L2,L3** |
| **9.** | Find $curl\ \bar{f}$ for $\bar{f} = 2xz^2\,\bar{i} - yz\,\bar{j} + 3xz^3\,\bar{k}$ | **L1,L2,L3** |
| **10.** | Find $curl\ \bar{f}$ for $\bar{f} = z\,\bar{i} + x\,\bar{j} + y\,\bar{k}$ | **L1,L2,L3** |
| **11.** | Show that $curl\,\bar{r} = 0$ where $\bar{r} = x\,\bar{i} + y\,\bar{j} + z\,\bar{k}$ | **L1,L2,L3** |
| **12.** | Show that $\bar{f} = 3y^4z^2i + z^3x^2j - 3x^2y^2k$ is solenoidal | **L1,L2,L3** |
| **13.** | Find p when $\bar{f} = (x+3y)i + (y-2z)j + (x+pz)k$ is solenoidal | **L1,L2,L3** |
| **14.** | Show that $\bar{f} = (y+z)\,\bar{i} + (z+x)\,\bar{j} + (x+y)\,\bar{k}$ is irrotational. | **L1,L2,L3** |
| **15.** | Find div $\bar{r}$ where $\bar{r} = x\,\bar{i} + y\,\bar{j} + z\,\bar{k}$ | **L1,L2,L3** |
| **16.** | Find the greatest value of the directional derivative of the function $f = x^2yz^3$ at $(2,1,-1)$ | **L1,L2,L3** |
| **17.** | If $\phi = 2xz^4 - x^2y$, find $\lvert\nabla\phi\rvert$ at the point $(2,-2,-1)$ | **L1,L2,L3** |
| **18.** | Find $div\ \bar{f}$ where $\bar{f} = xyi + yzj + zxk$ | **L1,L2,L3** |
| **19.** | Find $curl\ \bar{f}$ for $\bar{f} = xyi + yzj + zxk$ | **L1,L2,L3** |
| **20.** | | |
| | **PART-B (Ten Marks Questions)** | |
| **1.** | Find a unit normal vector to the surface $z = x^2 + y^2\ at\ (-1,-2,5)$ | **L1,L2,L3** |
| **2.** | If $\emptyset = 2x^3y^2z^4, then\ find\ div(grad\ \emptyset)$ | **L1,L2,L3** |
| **3.** | Find div $\bar{f}$ and curl $\bar{f}$ where $\bar{f} = grad\ (x^3 + y^3 + z^3 - 3xyz)$ | **L1,L2,L3** |
| **4.** | If $\bar{f} = xy^2i + 2x^2yzj - 3yz^2k\ then\ find\ div\ \bar{f}$ at (1,-1,1) | **L1,L2,L3** |
| **5.** | Find the greatest value of the directional derivative of the function $f = x^2yz^3$ at $(2,1,-1)$ | **L1,L2,L3** |
| **6.** | Find the directional derivative of $f = xy + yz + zx$ in the direction of the vector $\bar{i} + 2\,\bar{j} + 2\,\bar{k}$ at the point $(1,2,0)$. | **L1,L2,L3** |
| **7.** | Find the directional derivative of $f = 2xy + z^2$ at $(1,-1,3)$ in the direction of the vector $\bar{i} + 2\,\bar{j} + 3\bar{k}$. | **L1,L2,L3** |
| **8.** | Find the directional derivative of $f = x^2 - y^2 + 2z^2$ at the point $P = (1,\ 2,\ 3)$ in the direction of the line $PQ$ where $Q = (5,\ 0,\ 4)$ | **L1,L2,L3** |
| **9.** | Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at | **L1,L2,L3** |

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| | the point $(2, -1, 2)$ . | |
| **10.** | Evaluate the angle between the normal to the surface $xy = z^2$ at the points $(4, 1, 2)$ and $(3, 3, -3)$. | **L1,L2,L3** |
| **11.** | Evaluate $\nabla.\left(\frac{\bar{r}}{r^3}\right)$ where $\bar{r} = xi + yj + zk$ and $r = \lvert\bar{r}\rvert$ | **L1,L2,L3** |
| **12.** | Show that $\nabla(r^n) = nr^{n-2}\,\bar{r}$ | |
| **13.** | Show that $curl\,(r^n\,\bar{r}) = 0$ | **L1,L2,L3** |
| **14.** | Find the constants a, b and c if the vector $\bar{f} = (2x + 3y + az)\,\bar{i} + (bx + 2y + 3z)\,\bar{j} + (2x + cy + 3z)\,\bar{k}$ is Irrotational | **L1,L2,L3** |
| **15.** | Find $\nabla^2(\log\, r)$ | **L1,L2,L3** |

| Question No. | Questions | BLOOMS TAXONOMY |
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| | **UNIT – 5: VECTOR INTEGRATION** | |
| | **PART-A (Two Marks Questions)** | |
| **1.** | Define Line integral? | **L1** |
| **2.** | Define Surface integral? | **L1** |
| **3.** | Define Volume integral? | **L1** |
| **4.** | If $\bar{F} = x\,i - \,y\,j$ then evaluate $\int_C \bar{F}.dr$ where C is the line $y = x$ in the xy plane from (0,0) to (1,2) | **L1,L2,L3** |
| **5.** | If $\bar{F} = x\,i + \,y\,j$ then evaluate $\int_C \bar{F}.dr$ where C is the line $y = x^2$ in the xy plane from (0,0) to (1,1) | **L1,L2,L3** |
| **6.** | If $\bar{F} = x^2\,i - \,y^2\,j$ then evaluate $\int_C \bar{F}.dr$ where C is the curve x=t, y=t in the xy plane from t=0 to t=1. | **L1,L2,L3** |
| **7.** | What are the limits of x &y in the integral $\iint_R xy\,dx\,dy$ where R is the region bounded by x=0,y=0 and x+y=1 | **L1,L2,L3** |
| **8.** | What are the limits of x ,y &z in the integral $\iiint_V xyz\,dxdydz$ where v is the volume of the cube x=0, y=0, z=0, x=a, y=a, z=a | **L1,L2,L3** |
| **9.** | For any closed surface $S$, $\iint_S curl\,\bar{F}.\bar{n}\,dS$ by Gauss divergence theorem is? | **L1,L2,L3** |
| **10.** | State Stoke's theorem. | **L1** |
| **11.** | State Gauss Divergence theorem. | **L1** |
| **12.** | State Green's theorem. | **L1** |
| **13.** | Convert $\int_C (2xy - x^2)dx + (x^2 + y^2)dy$ into double integral over a region R by Green's theorem, where C is a simple closed curve bounded by a region R. | **L1,L2,L3** |
| **14.** | Convert $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ into double integral over a | **L1,L2,L3** |

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| | region R by Green's theorem, where C is a simple closed curve bounded by a region R. | |
| **15.** | Convert $\int_S \bar{F}.\bar{n}\,dS$ where $\bar{F} = xyi + z^2j + 2yzk$, into triple integrals over V by Gauss divergence theorem, where S is the closed surface bounded a region V. | **L1,L2,L3** |
| **PART-B (Ten Marks Questions)** | | |
| **1.** | If $\bar{F} = 3xy\,i - y^2\,j$ then evaluate $\int_C \bar{F}.dr$ where C is the curve $y = 2x^2$ in the xy plane from (0,0) to (1,2) | **L1,L2,L3** |
| **2.** | If $\bar{F} = (5xy - 6x^2)i + (2y - 4x)\,j$ then evaluate $\int_C \bar{F}.dr$ where C is the curve $y = x^3$ in the xy plane from (1,1) to (2,8) | **L1,L2,L3** |
| **3.** | Find the work done in moving a particle in the force field $\bar{F} = 3x^2\,\bar{i} + (2xz - y)\,\bar{j} + z\,\bar{k}$ along the straight line from (0,0,0) to (2,1,3). | **L1,L2,L3** |
| **4.** | Find the work done by the force $\bar{F} = (2y+3)i + (zx)j + (yz - x)k$ when it moves a particle from the point (0, 0, 0) to (2, 1, 1) along the curve $x = 2t^2, y = t, z = t^3$. | **L1,L2,L3** |
| **5.** | If $\bar{F} = xy\,\bar{i} - z\,\bar{j} + x^2\,\bar{k}$ and $C$ is the curve $x = t^2, y = 2t, z = t^3$ from $t = 0$ to $t = 1$. Evaluate $\int_C \bar{F}.d\bar{r}$. | **L1,L2,L3** |
| **6.** | Evaluate $\int_S \bar{F}.\bar{n}\,dS$ , where $\bar{F} = 18zi - 12j + 3yk$, and S is the part of the surface of the plane 2x+3y+6z=12 located in the first octant. | **L1,L2,L3** |
| **7.** | Evaluate $\int_C \left[ \left(3x^2 - 8y^2\right)dx + \left(4y - 6xy\right)dy \right]$ where C is the region bounded by $x = 0,\ y = 0$ and $x + y = 1$ by Green's Theorem. | **L1,L2,L3** |
| **8.** | Verify Green's theorem for $\int_C [(xy + y^2)dx + x^2dy]$ where C is bounded by y = x and y = $x^2$. | **L1,L2,L3** |
| **9.** | Evaluate by Green's theorem $\int_C (y - \sin x)\,dx + \cos x\,dy$ where C is the triangle enclosed by the lines y=0,x=$\frac{\pi}{2}$, $\pi y = 2x$ | **L1,L2,L3** |
| **10.** | Using Divergence theorem, evaluate $\iint_S (x\,dy\,dz + y\,dz\,dx + z\,dx\,dy)$, where $x^2 + y^2 + z^2 = a^2$. | **L1,L2,L3** |
| **11.** | Verify Stoke's theorem for the function $\bar{F} = x^2i + xyj$ integrated round the square in the plan z=0 whose sides are along the lines x=0,y=0,x=a,y=a. | **L1,L2,L3** |
| **12.** | Verify Stokes Theorem for $\bar{F} = (2x - y)\,\bar{i} - yz^2\,\bar{j} - y^2\,z\,\bar{k}$ over the upper half-surface of the sphere $x^2 + y^2 + z^2 = 1$ bounded by the projection of the *xy*- plane. | **L1,L2,L3** |
| **13.** | Verify Gauss divergence theorem for $\bar{F} = x^2i + y^2j + z^2k$, over the cube formed by the planes x=0,x=a, y=0,y=b, z=0, z=c. | **L1,L2,L3** |
| **14.** | If $\bar{F} = (2x^2 - 3z)i - 2xyj - 4xk$ then evaluate $\int_V \nabla.\bar{F}\,dv$ where V is the closed region bounded by x=0, y=0, z=0, 2x+2y+z=4 | **L1,L2,L3** |
| **15.** | Evaluate $\int_S \bar{F}.\bar{n}\,dS$ where $\bar{F} = z\,\bar{i} + x\,\bar{j} - 3y^2z\,\bar{k}$ and $S$ is the surface $x^2 + y^2 = 16$ included in the first octant between $z = 0$ and $z = 5$. | **L1,L2,L3** |