2 MARKS QUESTION

Ques) State Rolle's Theorem

Ques) Discuss all the Symmetory curve $x^2y^2 = x^2 - a^2$

Ques) Find the area bounded by curve $y^2 = x$ and $x^2 = y$.

Ques) State Stobe's theorem.

Ques) Evaluate $\int \tan^2 x \, dx$

Ques) Differentiate $\log \sin x^2$

Ques) If $x = r\cos\theta$ and $y = r\sin\theta$ then find $\frac{\partial(x,y)}{\partial(r,\theta)}$

Ques) If $u = x^2 + y^2 + 2xy$ then find the value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial x}$

Ques) Find the value of $\Gamma 3/2$

Ques) If $u = x(1-y)$; $v = xy$ find $\frac{\partial(u,v)}{\partial(x,y)}$

Ques) Evaluate $\int_0^2 \int_0^1 (x^2 + 3y^2)\, dy\, dx$

Ques) $u = \cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ then, find the value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$.

Ques) Find all symmetery of the curve $y^2(2a-x) = x^3$

Ques) Find rank of matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \\ 3 & 6 & 10 \end{bmatrix}$

Ques) If $u(x,y) = (\sqrt{x}+\sqrt{y})^5$ find the value of $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$

Ques) Find the inverse of the matrix $A=\begin{bmatrix}3 & 1\\ 2 & 1\end{bmatrix}$

Ques) Evaluate $\int_0^1\int_0^{x^2} xe^{y}\,dy\,dx$

Ques) State Gauss divergence theorem.

Ques) Find the rank of the matrix $\begin{bmatrix}2 & 2 & 2\\ 2 & 2 & 2\\ 2 & 2 & 2\end{bmatrix}$

Ques) Evaluate $\int_0^1\int_0^{x^2} e^{y/x}\,dx\,dy$

Ques) Find n^{th} derivative of x^2e^{-x} at $x=0$

Ques) Find Eigen value of A are $2,3,1$ then find the Eigen value of $A^{-1}+A^{2}$.

Ques) Evaluate $\int_0^\infty e^{-x^2}dx$

Ques) Find curl $\bar{r}$ where $\bar{r}=x\hat{i}+y\hat{j}+z\hat{k}$

Ques) If $y=\sin^3 x$ then the n^{th} derivatives (y_n) is.

Ques) Find Eigen value of the matrix $A=\begin{bmatrix}4 & 2\\ 2 & 4\end{bmatrix}$ correspondin to the eign vector $\begin{bmatrix}51\\ 51\end{bmatrix}$

Ques) Find curl of a vector field given by $\bar{F}=(x^2+xy^2)\hat{i}+(y^2+x^2y)\hat{j}$.

Ques) Evaluate $\iint y\,dx\,dy$ over the part of the plane bounded by the line $y=x$ and the parabola $y=4x-x^2$

5 MARKS QUESTION

Ques) Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ compute A^{-1} and prove that

$$A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I = \begin{bmatrix} 8 & 5 & 5 \\ 0 & 3 & 0 \\ 5 & 5 & 8 \end{bmatrix}$$

Ques) Find Eigen values and Eigen Vectors of matrix

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}$$

Ques) Find inverse of matrix $A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$

Ques) Find Eigen Values and Eigen Vectors of the following matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 3 & 0 \\ 1 & 0 & 2 \end{bmatrix}$

Ques) Reduce the matrix into normal form and hence find the rank of matrix $A = \begin{bmatrix} 1 & -2 & 5 \\ 4 & -9 & 10 \\ 3 & -6 & 15 \end{bmatrix}$

Ques) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 4 & 0 & 1 \\ 0 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ Hence find A^{-1}.

Ques) Find Rank of the matrix $A = \begin{bmatrix} 1 & 3 & 4 & 2 \\ 2 & -1 & 3 & 2 \\ 3 & -5 & 2 & 2 \\ 6 & -3 & 8 & 6 \end{bmatrix}$ by reducing it to normal form.

Ques) Diagonalise the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

Ques) Find inverse employing elementary transformation

$$A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$$

Ques) For different values of 'k' discuss the nature of solution of following equations-

$$x + 2y - z = 0$$
$$3x + (k+7)y - 3z = 0$$
$$2x + 4y + (k-3)z = 0$$

Ques) Find the eigen value and corresponding eigen vectors of the matrix A.

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 4 \\ -1 & -1 & -2 \end{bmatrix}$$

Ques) If $y\sqrt{x^2-1} = \log_e(x + \sqrt{x^2-1})$ Prove that,

$$(x^2-1)y_{n+1} + (2n+1)xy_n + n^2 y_{n-1} = 0$$

Ques) Trace the Curve $x^2y^2 = (a^2+y^2)(a^2-y^2)$ in xy-plane, where a is constant.

Ques) $u = x^2 + y^2 + 2xy$ find $\frac{\partial^2 u}{\partial x \partial y}$

Ques) $(x+y-10)dx + (x-y-2)dy = 0$ Solve.

Ques) If $u^3 + v^3 + w^3 = x + y + z$, $u^2 + v^2 + w^2 = x^3 + y^3 + z^3$ and $u + v + w = x^2 + y^2 + z^2$ then show that

$$\frac{\partial(u,v,w)}{\partial(x,y,z)} = \frac{(x-y)(y-z)(z-x)}{(u-v)(v-w)(w-u)}$$

Ques) Trace the curve $r^2 = a^2 \cos 2\theta$

Ques) If $u = f(2x-3y, 3y-4z, 4z-2x)$ prove that,

$$\frac{1}{2}\frac{\partial u}{\partial x} + \frac{1}{3}\frac{\partial u}{\partial y} + \frac{1}{4}\frac{\partial u}{\partial z} = 0.$$

Ques) Trace the curve $r = a(1+\cos\theta)$

Ques) Verify Euler's theorem function $u = \frac{x^2 y^2}{x+y}$

Ques) $\sin^{-1} y = 2\log(x+1)$ Show that,

$$(x+1)^2 y_{n+2} + (2n+1)(x+1) y_{n+1} + (n^2+4) y_n = 0$$

Ques) If $u = \cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ then show that $\cancel{x\frac{\partial u}{\partial x}}+$

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + \frac{1}{2}\cot u = 0$$

Ques) $u = \sec^{-1}\left(\frac{x^3-y^3}{x+y}\right)$ find $x^2 u_{xx} + 2xy_{xy} + y^2 u_{yy}$.

Ques) If $x = \sqrt{vw}$, $y = \sqrt{wu}$, $z = \sqrt{uv}$ and $u = r\sin\theta \cdot \cos\phi$, $v = r\sin\theta \cdot \sin\phi$, $w = r\cos\theta$ the calculate the Jacobian $\frac{\partial(x y z)}{\partial(r\theta,\phi)}$.

Ques) Find the Jacobian of the functions $y_1 = (x_1 - x_2)(x_2 + x_3)$, $y_2 = (x_1 + x_2)(x_2 - x_1)$, $y_3 = (x_1 - x_3)$ Hence show that, the function are not independent. Find relation b/w them.

Ques) If u, v and w are the roots of $(\lambda - x)^3 + (\lambda - y)^3 + (\lambda - z)^3 = 0$, cubic in λ, find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$

Ques) If $y = e^{\tan^{-1}x}$ prove that,

$$(1-x^2)y_{n+2} + [(2n+2)x - 1]y_{n+1} + n(n+1)y_n = 0$$

Ques) If
$$u^3 + v + w = x + y^2 + z^2$$
$$u + v^3 + w = x^2 + y + z^2$$
$$u + v + w^3 = x^2 + y^2 + z$$

Show that, $\frac{\partial(u,v,w)}{\partial(x,y,z)} = \frac{1 - 4xy(xy + yz + zx) + 16xyz}{2 - 3(u^2 + v^2 + w^2) + 27u^2v^2w^2}$

Ques) If $y = \sqrt{\frac{1-x}{1+x}}$ find dy/dx

Ques) Solve $\frac{dy}{dx} = e^{x-y} + xe^{-y}$

Ques) If $u = f(e^{y-z}, e^{z-x}, e^{x-y})$ prove that,

$$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$$

Ques) Find the derivative of $\frac{\sin(2x-3)}{\cos(4x-1)}$ withe respect to x.

Ques) Verify Green's theorem for $\int_C [(3x^2-8y^2)dx+(4y-6xy)dy]$ where C is the Boundary of the region bounded by the lines $x=0, y=0, x+y=1$.

Ques) Apply Green's theorem to evaluate $\int_C [(2x^2-y^2)dx+(x^2+y^2)dy]$ where C is the Boundary of the area enclosed by the x-axis and upper half of the circle $x^2+y^2=a^2$.

Ques) Verify Greens theorem to evaluate the line integral $\int_C (2y^2\,dx+3x\,dy)$, where C is the boundary of the closed region bounded by $y=x$ and $y=x^2$.

Ques) Using Green's Theorem Evaluate $\int_C (x^2+xy)dx$ ~~+(3xy-2xz) k is~~ $+(x^2+y^2)dy$, where C is the square formed by the lines $x=\pm 1, y=\pm 1$.

Ques) Using Green's Theorem Evaluate the line integral $\int_C [(y-\sin x)dx+\cos x\,dy]$ where C is the plane triangle Bounded by the lines $y=0, x=\pi/2, y=(2/\pi)x$.

Ques) A fluid Motion is given by $\bar{v}=(y\sin z-\sin x)\hat{i}+(x\sin z+2yz)\hat{j}+(xy\cos z+y^2)\hat{k}$ is the Motion irrotational. If so, find the Velocity.

Ques) Verify stoke's theorem for the function $F=x^2\hat{i}+xy\hat{j}$ integrated round the square whose sides are $x=0, y=0, x=a, y=a$ in the plane $z=0$.

Ques) Find the directional derivaties of $\phi(x,y,z)=x^2yz+4xz^2$ at $(1,-2,1)$ in the direction of $2\hat{i}-\hat{j}-2\hat{k}$. Find also the greatest rate of increase of ϕ.

Ques) Verify stoke's Theorem for $\bar{F}=(x^2+y^2)\hat{i}-2xy\hat{j}$ taken around the rectangle bounded by the lines $x=\pm a$, $y=0$, $y=b$.

Ques) Find DD of $\phi = 5x^2y-5y^2z+\frac{5}{2}z^2x$ at the point $P(1,1,1)$ in the direction of the line

$$\frac{x-1}{2}=\frac{y-3}{-2}=\frac{z}{1}$$

Ques) Show that the vector field $\bar{F}=\frac{\bar{r}}{r^3}$, where $r=|\bar{r}|$ is irrotational. Find the scalar potential.

Ques) If $\bar{r}=x\hat{i}+y\hat{j}+z\hat{k}$ and $r=|\bar{r}|$

i) $\text{div}\,\frac{\bar{r}}{|\bar{r}|^3}=0$

ii) $\text{div}(\text{grad}\, r^n)=n(n+1)r^{n-2}$

Ques) Prove that $\text{Curl}(\text{curl}\,\bar{F})=\text{grad}(\text{div}\,\bar{F})\cdot\nabla^2$

Ques) Evaluate $\oint_C \bar{F}\cdot d\bar{r}$ by stroke's theorem where, $\bar{F}=y^2\hat{i}+x^2\hat{j}-(x+z)\hat{k}$ and C is the boundary of the triangle with vertices at $(0,0,0)$, $(1,0,0)$, $(1,1,0)$.

Ques) Use Dirichlet's integral to evaluate $\iiint xyz\,dx\,dy\,dz$ throughout the volume bounded by $x=0$, $y=0$, $z=0$ and $x+y+z=1$.

Ques) Define Beta and Gamma function and Evaluate

$$\int_0^1 \left(\frac{x^2}{1-x^3}\right)^{1/2} dx$$

Ques) Find the mass of an octant of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$, the ~~distir~~ density at any point being $\rho = kxyz$.

Ques) Determine the area bounded by the curves $xy = 2$, $4y = x^2$ and $y = 4$.

Ques) Evaluate $\iiint_R (x-2y+z)\,dz\,dy\,dx$ where R is the region determine by $0 \le x \le 1$, $0 \le y \le x^2$, $0 \le z \le x+y$.

Ques) Evaluate the divergence theorem to evaluate the surface integral $\iint_S (x\,dy\,dz + y\,dz\,dx + z\,dx\,dy)$. where S is the portion of the plane $x+2y+3z=6$ which lies in the first octant.

Ques) Verify the divergence theorem for $F = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$ taken over the rectangular parallelopiped $0 \le x \le 1$, $0 \le y \le 1$, $0 \le z \le 1$,

Ques) Verify the divergence theorem for $\bar{F} = (x^3 - yz)\hat{i} + (y^3 - zx)\hat{j} + (z^3 - xy)\hat{k}$, taken over the cube bounded by planes $x=0, y=0, z=0, x=1, y=1, z=1$.

Ques) Apply Green's theorem to evaluate $\int_C [(2x^2-y^2)dx + (x^2+y^2)dy]$ where C is the boundary of the area enclosed by the x-axis and the upper half of the circle $x^2+y^2=a^2$?

Ques) Find the volume bounded by the cylinder $x^2+y^2=4$ and the plane $y+z=4$ and $z=0$.

Ques) Change the order of integration in $I=\int_0^1\int_{x^2}^{2-x} xy\,dy\,dx$ and hence evaluate the same.

Ques) Evaluate by changing of variables $\iint_R (x+y)^2\,dx\,dy$ where R is the region bounded by the parallelogram $x+y=0$, $x+y=2$, $3x+2y=0$ and $3x-2y=3$.

Ques) Evaluating the following integral by changing the order of integration $\int_0^\infty\int_x^\infty y e^{-y}\,dy\,dx$.

Ques) Evaluate $\int_2^4 \frac{x}{x^2+1}\,dx$

Ques) Find area bounded by $y^2=4ax$ and $y=x$.

Ques) Calculate the order of integration $\int_0^1\int_0^x dy\,dx$ and hence evaluate the same.

Ques) Evaluate $\iint dx\,dy$ over the region positive quadrant of the circle $x^2+y^2=9$.

Ques) Find the volume of the solid surmounted by the surface $\left(\frac{x}{a}\right)^{2/3}+\left(\frac{y}{b}\right)^{2/3}+\left(\frac{z}{c}\right)^{2/3}=1$.

Ques) Evaluate $\int_0^a\int_y^a \frac{x\,dx\,dy}{x^2+y^2}$ by changing the order of integration.

Ques) Compute $\iiint_V x^2\,dx\,dy\,dz$ over volume of tetrahedron bounded by $x=0$, $y=0$, $z=0$ and $x/a+y/b+z/c=1$

Ques) Divide 24 into three parts such that continued product of first, square of second and cube of third is a maximum.

Ques) A rectangular box is open at the top having capacity 32 c.c. Find the dimension of the box such that the least material is required for its construction.

Ques) Find the value of K for which the system of equation $(3K-8)x+3y+3z=0$, $3x(3K-8)y+3z=0$, $3x+3y+(3K-8)z=0$ has a non-trivial solution.

Ques) Show that the system of eq^n:-
$x+3y-2z=0$, $2x-y+4z=0$, $x-11v+14z=0$
has a non-trivial solution.

Ques) Find the Maximum and Minimum distance of the point $(1,2,-1)$ from the sphere $x^2+y^2+z^2=24$

Ques) Test the Consistency and hence, Solve the following set of eq^n $10y+3z=0$, $3x+3y+z=1$, $2x-3y-z=5$, $x+2y=4$.

Ques) If $u=\frac{x^2y^2}{x^2+y^2}+\cos\left(\frac{xy}{x^2+y^2}\right)$ prove that,

$$x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+y^2\frac{\partial^2 u}{\partial y^2}=2\frac{x^2y^2}{x^2+y^2}$$

Ques) Evaluate the double integral

$$\int_0^a\int_{\sqrt{ax}}^a\frac{y^2}{\sqrt{y^4-a^2x^2}}\,dx\,dy$$ by changing the order of integration.