Shree H.N.Shukla College of Science Rajkot
B.Sc. (Sem- II) (CBCS)
MATHS: M[201]
Prelims test Paper-2017

[Time:02:30 Hour] [Total Marks: 70]
Date: 31/3/2017. Time: 1:30 to 04:00

Q.1(A): Answer the following question in short: **[04]**

(1) Write the equation of the sphere with center $(\propto,\beta,\gamma)$ and radius a.
(2) Find the center and radius of the sphere $|\bar{r}|^2$ $-2\bar{r}\cdot(1,1,1) - 1 = 0$
(3) Define: Right circular cylinder
(4) Write the equation of cylinder whose axis is parallel to X-axis an radius r.

(B) Attempt any one out of two: **[02]**

(1) Find the radius of the circle that is obtain as intersection of the plane $x+2y+2z=15$ and the sphere is $x^2+y^2+z^2-2y-4z-20=0$
(2) Find the equation of the sphere through the circle $x^2+y^2+z^2=9$, $2x+3y+4z=5$ and point (1,2,3)

(C) Attempt any one out of two: **[03]**

(1) Obtain the equation of the sohere having the circle $x^2+y^2+z^2+10y-4z-8=0$, $x+y+z=3$ as the great circle.
(2) Find the equation of the cylinder whose generator is parallel to $\frac{x}{2}=\frac{y}{3}=\frac{z}{4}$ and passing through $x^2+xy+y^2=1;z=0$

(D) Attempt any one out of two: **[05]**

(1) Derive the equation of cylinder whose generator is parallel to $\frac{x}{l}=\frac{y}{m}=\frac{z}{n}$ and passing through the guiding curve $ax^2+2hxy+by^2+2gx+2fy+c=0$, $z=0$
(2) Show that the plane $2x-2y+z+12=0$ touches the sphere $x^2+y^2+z^2-2x-4y+2z-3=0$ and find the point of contact.

Q-2 (A) Answer the following question in short: **[04]**

(1) If u=log(tanx+tany) then $\sin 2x \partial u \partial x + \sin 2y \partial u \partial y$=_____
(2) If u $= \frac{\sqrt[4]{x}+\sqrt[4]{x}}{\sqrt[3]{x}+\sqrt[3]{x}}$ then find homogeneous degree of the function
(3) If u= f(x+at)+g(x-at) then find $\frac{\partial^2 u}{\partial x^2} =$ ____
(4) What is implicit function?

(B) Attempt any one out of two: **[02]**

(1) If $f(x,y)=\frac{x(x^2-y^2)}{(x^2+y^2)}$;$(x,y) \neq (0,0)$
=0 ; $(x,y)= (0,0)$ *at* $(0,0)$
Then find f_x and f_y of the function.
(2) If $w=\frac{y}{z}+\frac{x}{y}+\frac{z}{x}$ then p.t $x\frac{\partial w}{\partial x} + y\,\frac{\partial_w}{\partial_y} + z\frac{\partial_w}{\partial_z} = 0$

(C) Attempt any one out of two: **[03]**

(1) Verify Euler's theorem for the u = x + $\left(\frac{y}{x}\right)$
(2) If u = $\tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ then prove that $x\frac{du}{dx} + y\frac{du}{dy} = \sin 2u$

(D) Attempt any one out of two: **[05]**

(1) If $z(x+y) = x^2 + y^2$ show that $\left(\frac{dz}{dx} - \frac{dz}{dy}\right)^2 = 4\left(1 - \frac{dz}{dx} - \frac{dz}{dy}\right)$
(2) If u is a homogenous function of x, y of degree n then prove that $x^2\frac{d^2u}{dx^2} + 2xy\frac{d^2u}{dxdy} + y^2\frac{d^2u}{dy^2} = n(n-1)u$

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Q-3 (a) Answer the following question in short: **[04]**

(1) Define: jacobian.

(2) Find jecobian for cylindrical coordinates

(3) If $u = \frac{x+y}{1-xy}$ $v = tan^{-1} + tan^{-1}$ then find $\frac{\partial(u,v)}{\partial(x,y)}$

(4) If $x = cos\theta$ and $y = sin\theta$ then find jecobian.

(b) Attempt any one out of two: **[02]**

(1) If $f(x,y) = x^2y - 3y$ then find the approximate value of $f(5.12,6.85)$

(2) If there is 0.05% error obtain in measurement of length of sides of rectangle then what should be error in the measurement of its area.

(c) Attempt any one out of two: **[03]**

(1) Find the maximum value of $f(x,y,z) = xyz$ subject to the constraint $2x + 2y + z = 108$

(2)Find minima or maxima for the equation$f(x,y) = x^2 + 2y^2 - x$.

(d) Attempt any one out of two: **[05]**

(1) State and prove tailor's theorem

(2) Expand $x^2 + 3y - 2$in power of $x - 2$ and $y - 3$.

Q-4 (a) Answer the following question in short: **[04]**

(1) Define: orthogonal matrix.

(2) Define: involuntary matrix.

(3)Define: rank of matrix.

(4) What is the value of $\begin{vmatrix} 10 & 4 & 6 \\ 12 & 25 & 50 \\ 5 & 2 & 3 \end{vmatrix}$**?**

(b) Attempt any one out of two: **[02]**

(1) Check weather matrix $\begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$ is involuntary matrix or not?

(2) If $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ then find A^{-1}.

(c) Attempt any one out of two: **[03]**

(1) If $\begin{bmatrix} 0 & 2m & n \\ l & m & -n \\ l & -m & n \end{bmatrix}$ is orthogonal then find l,m and n.

(2)Prove associative law of matrices.

(d) Attempt any one out of two: **[05]**

(1) every square matrix can be uniquely expressed as a sum of symmetric and anti symmetric matrix.

(2)Using elementary row transformation find the inverse of matrix $\begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix}$

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Q-5(a) Answer the following question in short: **[04]**

(1) Find characteristic equation given matrix $\begin{bmatrix} 3 & 5 & 8 \\ 0 & 2 & 8 \\ 7 & 2 & 4 \end{bmatrix}$

(2) Define: eigen value

(3) What is the rank of identity matrix.

(4) In usual notation if A is any square matrix then $A^* = ?$

(b) Attempt any one out of two: **[02]**

(1) If $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ then find A^{-1}

(2)If matrix A is idempotent then prove that matrix $I - A$ is also idempotent

(c) Attempt any one out of two: **[03]**

(1) find rank of matrix $\begin{bmatrix} 0 & -1 & -2 \\ 8 & 9 & 10 \\ 8 & 8 & 8 \end{bmatrix}$

(2) Prove that for a hermitian matrix two eigen vector corresponding to two different eigen values are orthogonal to each other.

(d) Attempt any one out of two: **[05]**

(1)Test for consistency and solve

$5x + 3y + 7z = 4, 3x + 26y + 2z = 9,\ 7x + 2y + 10z = 5$

(2)State and prove caley hemilton theorem.

<u>ALL THE BEST</u>