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Mid-Term Examination, Even Semester 2019-20

B. Tech. (All Branches), I-Year, I-Semester

Subject Code and Name - BMAS 0101: Engineering Mathematics-I

Time: 2 Hours Maximum Marks: 30

## Section- A

*Note: Attempt All Three Questions..* (3 x 2 = 06 Marks)

1. If $u=x+2y+z,\ v=x+2y+3z,\ w=2x+3y+5z,$ find the Jacobian $\dfrac{\partial(u,v,w)}{\partial(x,y,z)}$

2. Find the asymptotes parallel to co-ordinate axes for the curve

$$y^2x^2=a^2(x^2+y^2)$$

3. Find the rank of following matrix by reducing it into Echelon form

$$\begin{bmatrix} 1 & 2 & 3 & -4 \\ -2 & 3 & 7 & -1 \\ 1 & 9 & 16 & -13 \end{bmatrix}$$

## Section- B

*Note: Attempt All Three Questions.* (3 x 3 = 09 Marks)

1. Find the Jacobian $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ of the following.

$$u=x+y+z,\ u^2v=y+z,\ u^3w=z$$

2. Calculate

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

for the function

$$u=f(2x-3y,\ 3y-4z,\ 4z-2x)$$

3. Find all the asymptotes of the curve

$$y^3-x^2y+2y^2+4y+1=0$$

## Section – C

***Note: Attempt Any Three Questions.*** (3 x 5 = 15 Marks)

1. Find the volume of a greatest rectangular parallelepiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$.

2. Expand $e^x \sin y$ in terms of $x$ and $y$ up to third degree by Taylor's series.

3. If $u=\tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$, then find

(i) $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$

(ii) $x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+y^2\frac{\partial^2 u}{\partial y^2}$

4. Test the consistency and hence solve the following set of equations by matrix method.

$$x_1+2x_2+x_3=2,\ 3x_1+x_2-2x_3=1,\ 4x_1-3x_2-x_3=3,\ 2x_1+4x_2+2x_3=4$$