Date: 29/10/2015 **Div: ALL** **ODD ROLL NUMBERS**

On Behalf of Mumbai University

VESIT

Internal Test-II

APPLIED MATHEMATICS (SEM I) (October-2015)

Time : 1 hour **Total Marks : 20**

Q-1	<u>Attempt any **TWO**</u>	**[6]**
(1)	Define linear independence of vectors. Check whether $V_1 = (1,2,4)$, $V_2 = (2,-1,3)$, $V_3 = (0,1,2)$, $V_4 = (-3,7,2)$ are linearly dependent or independent?	
(2)	Test the consistency of the following system $2x + y + 2z + w = 6$ $6x - 6y + 6z + 12w = 36$ $4x + 3y + 3z - 3w = -1$ $2x + 2y - z + w = 10$	
(3)	Find two non singular matrices P and Q such that PAQ is in normal form, and find rank $A = \begin{bmatrix} 1 & 3 & 4 & 2 \\ 2 & -1 & 3 & 2 \\ 3 & -5 & 2 & 2 \\ 6 & -3 & 8 & 6 \end{bmatrix}$	
Q-2	<u>Attempt any **TWO**</u>	**[6]**
(1)	If $u = \sin^{-1}\left(\frac{x}{y}\right) + \tan^{-1}\left(\frac{y}{x}\right)$, Find value of $x\frac{\partial u}{\partial x} - y\frac{\partial u}{\partial y}$	
(2)	If $u = f\left(\frac{y-x}{xy}, \frac{z-x}{zx}\right)$ Find value of $x^2\frac{\partial u}{\partial x} + y^2\frac{\partial u}{\partial y} + z^2\frac{\partial u}{\partial z}$	
(3)	If $\begin{matrix} x^2 - y^2 + u^2 + 2v^2 = 1 \\ x^2 + y^2 - u^2 - v^2 = 2 \end{matrix}$; Find $\frac{\partial u}{\partial y}$ and $\frac{\partial v}{\partial y}$	
Q-3 (a)	<u>Attempt any **ONE**</u>	
(1)	Solve by Crout's Method $x + y - z = 2$ $2x + 3y + 5z = -3$ $3x + 2y - 3z = 6$	**[4]**

$\cos^{-1}x : \frac{1}{\sqrt{1-x^2}}$ $\frac{1}{1+x^2}$ $\frac{1}{\sqrt{1+x^2}}$ $\sqrt{1-x^2}$ $3(1)+(-1)(7)+U_{33} = -3$

$3-7 = -3$

$\frac{\sin^{-1}x}{\cos^{-1}x}$ $= -3+4$

$= 1$

(2)	Solve By Jacobi Iteration Method and correct upto four decimal places 5 iter $5x+2y+z=12$ $x+4y+2z=15$ $x+2y+5z=20$	
Q-3 (b)	<u>Attempt any **ONE**</u>	[4]
(1)	If $u=f(x,y)$, where $x=e^r\cos\theta$; $y=e^r\sin\theta$,Show that $e^{2r}\left[(u_x)^2+(u_y)^2\right]=\left[(u_r)^2+(u_\theta)^2\right]$	
(2)	If u is Homogeneous function of three variables x,y,z of degree n, then prove that $x^2\frac{\partial^2 u}{\partial x^2}+y^2\frac{\partial^2 u}{\partial y^2}+z^2\frac{\partial^2 u}{\partial z^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+2yz\frac{\partial^2 u}{\partial y\partial z}+2xz\frac{\partial^2 u}{\partial x\partial z}=n(n-1)\,u$	
	ALL THE BEST	

$$(u_x)^2 = \left(\frac{\partial u}{\partial x}\right)^2$$

$$(u_x)^2 : \frac{\partial^2 u}{\partial x^2}$$