Sanjay Ghodawat University, Kolhapur
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2018-19
EXM/P/09/01

Year and Program:2018-19 | **School of Technology** | **Department of FY B.Tech**

Course Code: FYT101 | **Course Title: Matrices and Multivariable Calculus** | **Semester – I**

Day and Date: Monday, 19/11/2018 | **End Semester Examination (ESE)** | **Time:** **Max Marks: 100**

Instructions:
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Non-programmable calculator is allowed

Q.1	**Solve any Two**	Marks	Bloom's Level	CO
a)	Find the rank by using normal form of following matrix $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$	07	L1	CO1
	OR			
a)	Solve, $2x-y+3z=1, 3x+2y+z=3, x-4y+5z=-1$	07	L3	CO1
b)	Examine the linear dependence and independence of vectors and if dependent, find relation between them for [1,2,3], [3,-2,1], [1,-6,-5]	08	L2	CO2
	OR			
b)	Find the Eigen values and Eigen vector for the largest Eigen value of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$	08	L3	CO2

Q.2 **Solve any Two**

a) If $u = x^2 \tan^{-1}\left(\frac{y}{x}\right) - y^2 \tan^{-1}\left(\frac{x}{y}\right)$; Show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{x^2 - y^2}{x^2 + y^2}$ — 07 L5 CO3

OR

a) If $u = \cos^{-1}\left[\frac{\sqrt{x^2 + y^2}}{\sqrt{x - y}}\right]$; prove that — 07 L3 CO3

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -\frac{\cot u \cos 2u \cos ec^2 u}{4}$$

b) Find the maxima and minima of $f(x, y) = x^3 + y^3 - 3axy,\ a > 0$ — 08 L4 CO4

OR

b) Show that $\int_0^1 \frac{x^a - 1}{\log x} dx = \log(a+1)$, a>0 — 08 L3 CO4

Q.3 **Solve any Two**

a) Solve — 08 L2 CO1

$x + 2y + 3z = 0, 2x + 3y + z = 0, 4x + 5y + 4z = 0, 3x + y - 2z = 0$

b) Use Cayley Hamilton's theorem to find A^{-1} for the matrix — 08 L2 CO2

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

c) If $u = x + y + z,\ v = y + z,\ w = z$, find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$ — 08 L5 CO3

d) The torsional rigidity N of length l of a wire is obtained by $N = \frac{8\pi l}{r^4 t^2}$. — 08 L2 CO4

Find the percentage error in N due to -2%error in l , 2% error in r and 1.5 % error in t.

Q.4 **Solve any Two**

a) Change the order of integration and evaluate $\int_0^4 \int_y^4 \frac{x dx dy}{x^2 + y^2}$. — 09 L5 CO5

	b)	Evaluate $\iint_R \frac{xydxdy}{\sqrt{1-y^2}}$ over the positive quadrant of circle $x^2+y^2=1$.	09	L5	CO5
	c)	Change to polar coordinates and evaluate $\int_0^a \int_y^a xdxdy$	09	L5	CO5
Q.5		**Solve any Two**			
	a)	Find the area bounded by $y^2=4x$ & $x^2=4y$ using double integration	09	L3	CO6
	b)	Find the volume of torus generated by revolving the circle $x^2+y^2=4$ about the line x=3	09	L3	CO6
	c)	Find the Moment of inertia about X axis of $y^2=x$ between the points (0,0) and(4,2)	09	L4	CO6
Q.6		**Solve any Three**			
	a)	Evaluate the following integral $\int_0^1 \int_{x^2}^{2-x} xy\,dxdy$	06	L3	CO5
	b)	Evaluate the following integral $\int_0^{\pi} \int_0^{a(1-\cos\theta)} 2\pi r^2 \sin\theta drd\theta$	06	L3	CO5
	c)	Find the area of $r=a(1+\cos\theta)$ using double integration	06	L3	CO6
	d)	The density of circular lamina $x^2+y^2=a^2$ is k time's distance from a given diameter. Find its mass.	06	L5	CO6

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