Sanjay Ghodawat University, Kolhapur 2018-19
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Year and Program:2018-19 F.Y.B. Tech.	**School of Technology**	**Department of F.Y. B. Tech**
Course Code: FYT101	**Course Title: Matrices and Multivariable Calculus**	**Semester – I**
Day and Date: Tuesday 11/06/2019	**End Semester Examination (ESE)**	**Time:** 3Hrs. 10.30 am to 1.30 pm **Max Marks: 100**

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

			Marks	Bloom's Level	CO
Q.1		**Solve any Two**			
	a)	Find the rank of following matrix by using normal form. $\begin{bmatrix} 1 & -1 & 2 & -3 \\ 2 & 4 & 3 & 6 \\ -1 & -2 & 6 & 4 \\ 3 & 4 & 1 & 1 \end{bmatrix}$	07	L3	CO1
		OR			
	a)	For what values of λ the equations $x+y+z=1;\ 2x+y+4z=\lambda;\ 4x+y+10z=\lambda^2$ have a solution? Solve it for all values of λ.	07	L4	CO1
	b)	Examine the linear dependence and independence of vectors $[2,-1,3,2]$, $[1,3,4,2]$, $[3,-5,2,2]$ and if dependent, find relation between them.	08	L4	CO2
		OR			
	b)	Find the Eigen values and Eigen vectors of $A=\begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$.	08	L2	CO2
Q.2		**Solve any Two**			
	a)	If $u=x^2(y-z)+y^2(z-x)+z^2(x-y)$ then show that	07	L2	CO3

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

OR

			Marks	Level	CO
	a)	If $u=\sin^{-1}\left[\frac{x^{1/4}+y^{1/4}}{x^{1/5}+y^{1/5}}\right]$ then prove that i) $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\frac{\tan u}{20}$ ii) $x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+y^2\frac{\partial^2 u}{\partial y^2}=\frac{\tan u}{400}\left(\tan^2 u-19\right)$.	07	L2	CO3
	b)	Find the minimum and maximum values of $f(x,y)=x^3+3xy^2-3x^2-3y^2+4$.	08	L4	CO4
		OR			
	b)	Find $\int_0^\infty \frac{e^{-x}(1-e^{-ax})}{x}dx$ (where $a>-1$) and hence evaluate $\int_0^\infty \frac{e^{-x}(1-e^{-7x})}{x}dx$.	08	L3	CO4
Q.3		**Solve any Two**			
	a)	Solve if consistent $x+2y-z=3;\ 3x-y+2z=1;\ 2x-2y+3z=2;\ x-y+z=-1$.	08	L2	CO1
	b)	Verify Cayley Hamilton's theorem for $A=\begin{bmatrix}1 & 2 & -2\\ -1 & 3 & 0\\ 0 & -2 & 1\end{bmatrix}$ and hence find A^{-1}.	08	L3	CO2
	c)	If $x=e^v\sec u, y=e^v\tan u$; then show that $\frac{\partial(x,y)}{\partial(u,v)}\cdot\frac{\partial(u,v)}{\partial(x,y)}=1$	08	L2	CO3
	d)	Find the approximate values of i) $\sqrt{25.15}$ ii) $x^2y^{1/10}$ for $x=1.99\ \&\ y=1.01$	08	L2	CO4
Q.4		**Solve any Two**			
	a)	Change the order of integration and evaluate $\int_0^{\pi/2}\int_x^{\pi/2}\frac{\cos y}{y}dxdy$.	09	L3	CO5
	b)	Evaluate $\iint_R e^{3x+4y}dxdy$ over the triangle bounded	09	L1	CO5

by $x=0, y=0 \,\&\, x+y=1$.

	c)	Change to polar coordinates and evaluate $\int_0^a \int_y^a x\,dx\,dy$.	09	L2	CO5
Q.5		**Solve any Two**			
	a)	Find the area bounded by $y^2=4ax \,\&\, x^2=4ay$ using double integration.	09	L2	CO6
	b)	Find the volume generated by revolving $r=a(1-\cos\theta)$ about initial line.	09	L3	CO6
	c)	Find the Moment of inertia about X-axis of the area enclosed by $x+y=1, x=0, y=0$.	09	L2	CO6
Q.6		**Solve any Three**			
	a)	Evaluate the following integral $\int_0^1 \int_{x^2}^{2-x} xy\,dx\,dy$.	06	L1	CO5
	b)	Evaluate the following integral $\int_0^\pi \int_0^{a(1-\cos\theta)} 2\pi r^2 \sin\theta\,dr\,d\theta$.	06	L1	CO5
	c)	Find the area of $r=a(1+\cos\theta)$ using double integration.	06	L2	CO6
	d)	Find the mass of lamina bounded by $y=x, y=0 \,\&\, x=2$ having uniform density.	06	L3	CO6

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