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 (old)** | **Semester – I**

Day and Date: Monday 13/11/18 | **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

		Marks	Bloom's Level	CO
Q.1	**Solve the following**			
a)	Find the rank by using normal form of following matrix $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$	05	L1	CO1
b)	Solve $2x-y+z=0, 3x+2y+z=0, x-4y+5z=0$	05	L2	CO1
c)	Solve if consistent $2x-y-z=2, x+2y+z=2, 4x-7y-5z=2$;	06	L2	CO1
	OR			
	Investigate for what values of λ and μ the system of equations $x+y+z=6$, $x+2y+3z=10$, $x+2y+\lambda z=\mu$ have 1) no solution 2) unique solution & 3)infinite number of solutions	06	L2	CO1
Q.2	**Solve the following**			
a)	Examine the linear dependence and independence of vectors $(1,-2,-3\ 4)$; $(-2,\ 4,-1,\ 3)$; $(-1,\ 2,\ 7,\ 6)$	05	L3	CO2
b)	Find the Eigen values of A, A^{-1} & AdjA where $A=\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$	05	L1	CO2

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c) Verify Cayley Hamilton's theorem for $A=\begin{bmatrix}1 & 2 & -2\\ -1 & 3 & 0\\ 0 & -2 & 1\end{bmatrix}$ — 06 L1 CO2

OR

c) Use Cayley Hamilton's theorem to find A^{-1} for the matrix — 06 L2 CO2

$$A=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$$

Q.3 **Solve any Three**

a) If $z=\tan(y-ax)+(y-ax)^{3/2}$ then prove that $\frac{\partial^2 z}{\partial x^2}-a^2\frac{\partial^2 z}{\partial y^2}=0$ — 06 L1 CO3

b) If $x=e^u+e^{-v}, y=e^{-u}-e^{v}$; prove that $\frac{\partial z}{\partial u}-\frac{\partial z}{\partial v}=x\frac{\partial z}{\partial x}-y\frac{\partial z}{\partial y}$ — 06 L3 CO3

& $z=f(x,y)$

c) If $u=\frac{x^{1/4}+y^{1/4}}{x^{1/5}+y^{1/5}}$; show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\frac{u}{20}$ — 06 L3 CO3

d) If $x=uv, y=\frac{u+v}{u-v}$; then find $\frac{\partial(x,y)}{\partial(u,v)}$ — 06 L1 CO3

Q.4 **Solve the following**

a) Find the maxima and minima of $f(x,y)=x^3+3xy^2-3x^2-3y^2+4$ — 05 L2 CO4

b) Find the percentage error in the area of ellipse if 1% error is made in measuring major and minor axes where area of ellipse is $A=\pi ab$. — 05 L3 CO4

c) Show that $\int_0^{\infty}\frac{e^{-x}(1-e^{-ax})}{x}dx=\log(1+a);\ where\ a>-1$ — 06 L1 CO4

OR

c) Divide 24 into three parts x, y & z, such that the continued product xy^2z^3 may be maximum — 06 L2 CO4

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Q.5 **Solve any three**

a)	Evaluate the following integral $\int_0^{\pi/2}\int_0^{a\cos\theta} r\sin\theta\, dr\, d\theta$	06	L1	CO5
b)	Evaluate the following integral $\int_0^1 dx \int_0^2 dy \int_1^2 x^2 yz\, dz$	06	L1	CO5
c)	Change the order of integration and evaluate $\int_0^1\int_x^{2-x} \frac{x}{y}\, dx\, dy$	06	L3	CO5
d)	Evaluate $\iint(x^2-y^2)x\,dx\,dy$ over the positive quadrant of circle $x^2+y^2=a^2$	06	L2	CO5

Q.6 **Solve the following**

a)	Find the area of $r=a(1+\cos\theta)$ using double integration	05	L3	CO6
b)	Find the Moment of inertia about X axis of the parabola $y^2=x$ lying between the points (0,0) and(4,2)	05	L3	CO6
c)	Find the volume generated by revolving $r=a(1-\cos\theta)$ about X axis	06	L3	CO6
	OR			
c)	Find the mass of lamina bounded by $y=x, y=0 \& x=2$ having uniform density.	06	L3	CO6

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