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

Course Code: FYT101 | **Course Title: Matrices and Multivariable Calculus (Old)** | **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) Use of non-programmable calculator is allowed

		Marks	Bloom's Level	CO
Q.1	**Solve the following.**			
a)	Find the rank by using normal form of the following matrix $\begin{bmatrix} 1 & -1 & 2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 1 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$	05	L1	CO1
b)	Solve $x+y+2z=0;\ 2x+3y+z=0;\ 4x+5y+4z=0;\ 3x+y-2z=0.$	05	L2	CO1
c)	Examine for consistency and solve if consistent $x+2y-z=1;\ 3x-2y+2z=2;\ 7x-2y+3z=5.$	06	L2	CO1
	OR			
c)	Find the value of λ for which the following equations $(1-\lambda)x+2y+3z=0;\ 3x+(1-\lambda)y+2z=0;\ 2x+3y+(1-\lambda)z=0.$ have a non- zero solution. Solve it for real values of λ.	06	L2	CO1
Q.2	**Solve the following.**			
a)	Examine the linear dependence and independence of vectors $[1,2,1]$, $[2,1,4]$, $[4,5,6]$. If dependent, find relation between them.	05	L3	CO2
b)	Find the Eigen values of $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ and hence find Eigen	05	L1	CO2

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vector for largest Eigen value.

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

OR

c) Find the Eigen values of $A=\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$ 06 L2 CO2

Hence by using properties of Eigen values, find Eigen values of

1) $AdjA$ 2) A^{-1} 3) A^2

Q.3 **Solve any Three**

a) If $u=\sin(x^2-y^2)+\sin(y^2-z^2)+\sin(z^2-x^2)$ then prove that $\frac{1}{x}\frac{\partial u}{\partial x}+\frac{1}{y}\frac{\partial u}{\partial y}+\frac{1}{z}\frac{\partial u}{\partial z}=0$ 06 L1 CO3

b) If $z=\log(x^2+y^2)$ then show that $\frac{\partial^2 z}{\partial x \partial y}=\frac{\partial^2 z}{\partial y \partial x}$ 06 L3 CO3

c) If $u=\log\left[\frac{x^2+y^2}{x-y}\right]$; then find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$ and $x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x \partial y}+y^2\frac{\partial^2 u}{\partial y^2}$ 06 L3 CO3

d) If $x=r\cos\theta, y=r\sin\theta$; then show that $\frac{\partial(x,y)}{\partial(r,\theta)}\cdot\frac{\partial(r,\theta)}{\partial(x,y)}=1$ 06 L1 CO3

Q.4 **Solve the following.**

a) Find the maxima and minima of $x^3+3xy^2-15x^2-15y^2+72x$. 05 L2 CO4

b) If the measurements of radius of base and height of a right circular cone was incorrect by -1% &2%, then prove that there will be no error in volume. (Where volume of right circular cone whose 05 L3 CO4

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height is y and radius of base is x, is given by $V = \frac{1}{3}\pi x^2 y$)

c) Show that $\int_0^1 \frac{x^\alpha - x^\beta}{\log x} dx = \log\left(\frac{1+\alpha}{1+\beta}\right)$. 06 L1 CO4

OR

c) Divide 75 into three parts x, y & z, such that their product xyz is maximum 06 L2 CO4

Q.5 **Solve any three**

a) *Evaluate the following integral* $\int_0^{\pi} \int_0^{a\sin\theta} r dr d\theta$ 06 L3 CO5

b) Evaluate the following integral $\int_0^1 \int_{y^2}^1 \int_0^{1-x} xdzdxdy$ 06 L1 CO5

c) Change the order of integration and evaluate $\int_0^4 \int_y^4 \frac{xdxdy}{x^2+y^2}$ 06 L3 CO5

d) Change to polar coordinates and evaluate $\int_0^a \int_y^a xdxdy$ 06 L2 CO5

Q.6 **Solve the following**

a) Find the area of $x^2 + y^2 = a^2$ using double integration 05 L3 CO6

b) Find the Moment of inertia about x axis of the area enclosed by $x + y = 1, x = 0, y = 0$ 05 L3 CO6

c) Find the volume generated by revolving $r = a(1+\cos\theta)$ about initial line. 06 L3 CO6

OR

c) The density of circular lamina $x^2 + y^2 = a^2$ is k time's distance from a given diameter. Find its mass using double integration. 06 L3 CO6

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