Reg. No.:

Name :

VIT BHOPAL
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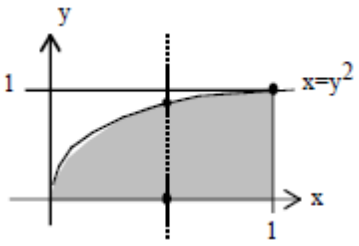
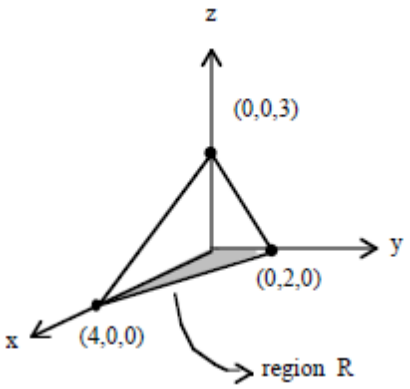
TERM END EXAMINATIONS (TEE) – January 2021

Programme	**B.Tech – CSE Health Informatics**	**Semester**	**Fall 2021-22**
Course Name	**Introduction to Calculus**	**Course Code**	**MAT1031**
Faculty Name	**Dr. Neha Choubey**	**Slot / Class No**	**F11+F12+F13/0613**
Time	**1½ hours**	**Max. Marks**	**50**

Answer ALL the Questions

Q. No.			Marks
		PART - A – (3 x 10 = 30 Marks)	
1	(a)	Divide the profit of the company 120 into three criteria a, b and c so that the sum of their products taken two at a time shall be maximum.	10
		OR	
	(b)	If $u = sec^{-1}\frac{(x^3+y^3)}{(x-y)}$, then find a) $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ b) $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2}$	10
2	(a)	Chose the correct order of integration from the following figure to evaluate the integral $\iint_R ye^{x^2}dA$  .	10
		OR	
	(b)	Evaluate the integral by changing it into polar form $\int_0^2 \int_0^{\sqrt{4-x^2}} y^2\sqrt{x^2+y^2}dydx.$	10
3	(a)	Find the equation of the plane to calculate the volume of the tetrahedron given in the following figure and bounded by the coordinate axis and plane	10



OR

(b) Find the algebraic multiplicity and geometric multiplicity of an eigen value of the matrix 10

$$A = \begin{bmatrix} -3 & -7 & -5 \\ 2 & 4 & 3 \\ 1 & 2 & 2 \end{bmatrix}$$

and also show that geometric multiplicity is less than the algebraic multiplicity.

Part - B – (2 x 10 = 20 Marks)

10

4 (i) Determine the slope of the curved surface in the constant $y = 1.983$ plane at $(5.6380, 1.983)$. The 3D surface is $f(x, y) = x^7 + 5x^3y - y^3$.

(ii) The surface area (in square meters) of a particular mammal is approximated by the function $A(m, h) = \frac{7}{3}m^{0.658}h^{0.189}$, where m is the mass of the mammal (in kg) and h is the height (in meters). Evaluate $\frac{\partial A}{\partial m}$ and $\frac{\partial A}{\partial h}$, when $m = 30$ and $h = 10$.

5 10

Determine the values of α and β for which the system

$$\begin{bmatrix} 4 & -1 & 0 \\ -1 & 5 & -2 \\ 0 & 2 & \alpha \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \beta \\ 0 \\ -8 \end{bmatrix}$$

has

i. Unique solution
ii. Infinite solution
iii. No solution.

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