Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Generic Elective Calculus
Semester: II
Program: B.Sc. (Hons.) Physics/Chemistry/Geology
Time: 03 hrs.
Course Code: MATH 1033 **Max. Marks: 100**

Instructions: Attempt all questions.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Use epsilon and delta definition of limit to show that the $\lim_{x\to 8} \sqrt[3]{x} = 2$	**4**	**CO1**
Q 2	Perform successive differentiation to find the nth derivate of $e^x(2x+3)^3$	**4**	**CO2**
Q 3	For the curve $r = asinn\theta$, prove that $p^2 = \frac{r^4}{n^2a^2-(n^2-1)r^2}$	**4**	**CO3**
Q 4	Expand $\left(\frac{1+e^x}{2e^x}\right)^{1/2}$ up to the term containing x^2.	**4**	**CO5**
Q 5	If u is a homogeneous function of two variables x, y, z of degree, n then show that $$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial y} = nu$$	**4**	**CO6**

SECTION B
(4Qx10M= 40 Marks)

Q 1	Sketch the Cycloid $x = a(t + sint), y = a(1 - cost)$	**10**	**CO4**
Q 2	Discuss the function $x^3y^2(12 - 3x - 4y)$ for extreme values.	**10**	**CO5**
Q 3	If $x^xy^yz^z = c$ show that at $x = y = z$ $$\frac{\partial^2 z}{\partial x \partial y} = -(xlogex)^{-1}$$	**10**	**CO2**

Q 4	State and prove Leibnitz's theorem **OR** Establish the formula for length of perpendicular from pole to the tangent in polar coordinates.	**10**	**CO6**
SECTION-C (2Qx20M=40 Marks)			
Q 1 (a)	Expand $\sqrt{1+x+2x^2}$ in powers of $(x-1)$. **OR** Verify Rolle's theorem for the function $f(x)=x(x+3)e^{-x/2}$ in $-3 \le x \le 0$.	**10**	**CO5**
(b)	Trace the Cardioid r= $a(1-cos\theta)$ **OR** Trace the Folium of Descartes $x^3+y^3=3axy$	**10**	**CO4**
Q 2 (a)	Discuss the asymptotes of: $(x-y)^2(x^2+y^2)-10(x-y)x^2+12y^2+2x+y=0$	**10**	**CO3**
(b)	Evaluate $\lim_{x\to\infty} sin^{-1}\sqrt{\frac{a-x}{a+x}}cosec\sqrt{a^2-x^2}$	**10**	**CO5**