Name:	
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

Programme Name: B. Sc. (H.) (Physics/Chemistry) **Semester : II**
Course Name : Calculus **Time : 03 hrs**
Course Code : MATH 1033 **Max. Marks : 100**
Nos. of page(s) : 2

SECTION A
(All questions are compulsory)

S. No.		Marks	CO
Q 1	What value should be assigned to $f(x)=\frac{1-x}{1-x^{1/3}}, x\neq 1$ at x=1, so that it is continuous at x=1	4	CO 1
Q 2	Investigate the continuity at (0, 0) of $f(x,y)=\begin{cases} \frac{x^2-y^2}{x^2+y^2}, & (x,y)\neq(0,0) \\ 0 & (x,y)=(0,0,) \end{cases}$	4	CO 2
Q 3	Find the equation of the envelope of the family of curves $x\,cos\alpha + y\,sin\alpha = p$ where p is a constant and α is a parameter.	4	CO 3
Q 4	Find the points of inflection of the curve $y= 3x^4 + 4x^3 + 6x^2+ 12x + 12$	4	CO 4
Q 5	Using the mean value theorem show that $\lvert\cos b-\cos a\rvert\leq\lvert b-a\rvert$	4	CO 5

SECTION B
(All questions are compulsory, Question 9 has internal choices)

Q 6	Show that for all $x > 0$, $1-x < e^{-x} < 1 - x + x^2/2$	10	CO 5
Q 7	Find the asymptotes of the curve $(2x + 3)\, y = (x-1)^2$	10	CO 3
Q 8	Trace the curve $x^3+y^3= 3axy$, where a is a constant.	10	CO 4
Q 9	Show that $\lim_{x\to 1} 2^{\frac{1}{(x-1)}}$ does not exist.	10	CO 1
	OR		
Q 9	.Prove that, if f is derivable at c and $f(c)\neq 0$ then the function $1/f$ is also derivable	10	CO 1

	thereat and $\left(\frac{1}{f}\right)'(c)=\frac{-f(c)}{\{f(c)\}^2}$		
	SECTION C **(All questions are compulsory, Question 11 has internal choices)**		
Q 10 (A)	Show that the normal to a given curve is a tangent to its evolute.	**10**	**CO 3**
Q 10 (B)	Sketch the graph of the curve $y=\frac{(x-1)(x-3)}{x^2}$	**10**	**CO 4**
Q 11 (A)	Show that the function $f(x,y)=\begin{cases}\frac{x^3+2y^3}{x^2+y^2}, & (x,y)\neq 0\\ 0, & (x,y)=(0,0)\end{cases}$ (i) is continuous at (0, 0) (ii) possesses partial derivatives $f_x(0, 0)$ and $f_y(0, 0)$ (iii) is not differentiable at (0, 0)	**10**	**CO 2**
Q 11 (B)	Find the n^{th} derivative of y where $y = e^{ax}.\ Cos\ (bx+c)$	**10**	**CO 2**
	OR		
Q 11 (A)	Determine $y_n(0)$ where $y=e^{m\cos^{-1}x}$	**10**	**CO 2**
Q 11 (B)	If $z = f(x, y)$, $x=r\cos\theta$, $y= r\sin\theta$ then show that $\left(\frac{\partial f}{\partial x}\right)^2+\left(\frac{\partial f}{\partial y}\right)^2=\left(\frac{\partial f}{\partial r}\right)^2+\frac{1}{r^2}\left(\frac{\partial f}{\partial \theta}\right)^2$	**10**	**CO 2**

Name:	
Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

Programme Name: B. Sc. (H.) (Physics/Chemistry) **Semester : II**
Course Name : Calculus **Time : 03 hrs**
Course Code : MATH 1033 **Max. Marks : 100**
Nos. of page(s) : 2

SECTION A
(All questions are compulsory)

S. No.		Marks	CO
Q 1	Evaluate $\lim_{x\to\infty} x\tan\frac{1}{x}$	4	CO 1
Q 2	Investigate the continuity at (0, 0) of $f(x,y)=\begin{cases}\frac{\sin^{-1}(x+2y)}{\tan^{-1}(2x+4y)}, & (x,y)\neq(0,0)\\ 0 & (x,y)=(0,0,)\end{cases}$	4	CO 2
Q 3	Find the equation of the envelope of the family of straight lines $y= cx + c^2$, where c is a parameter.	4	CO 3
Q 4	Find the points of inflection of the curve $y=e^{-x^2}$.	4	CO 4
Q 5	Using the mean value theorem show that $\lvert\cos b-\cos a\rvert\leq\lvert b-a\rvert$	4	CO 5

SECTION B
(All questions are compulsory, Question 9 has internal choices)

Q 6	Find the maximum/minimum values of the function $f(x)=\sin x(1+\cos x), 0\leq x\leq 2\pi$. Also find the greatest and smallest values	10	CO 5
Q 7	Find the asymptotes of the curve $(2x + 3)\,y = (x-1)^2$	10	CO 3
Q 8	Trace the curve $y=\frac{x^2}{\sqrt{x^2-4}}$	10	CO 4
Q 9	Show that $\lim_{x\to 1} 2^{\frac{1}{(x-1)}}$ does not exist.	10	CO 1

	OR		
Q 9	Define uniform continuity and show that $f(x)= 1/x$ is not uniformly continuous on (0, 1]	**10**	**CO 1**
	SECTION C **(All questions are compulsory, Question 11 has internal choices)**		
Q 10 (A)	Find the evolute of the curve $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.	**10**	**CO 3**
Q 10 (B)	Sketch the graph of the curve $y=x+\frac{1}{x}$.	**10**	**CO 4**
Q 11 (A)	If f is a homogeneous function of x and y of degree n then show that $x\frac{\partial f}{\partial x}+y\frac{\partial f}{\partial y}=nf$	**10**	**CO 2**
Q 11 (B)	Find the n^{th} derivative of y where $y=e^{ax}.\ Sin\ (bx+c)$	**10**	**CO 2**
	OR		
Q 11 (A)	State and Prove Leibnitz's theorem of successive differentiation.	**10**	**CO 2**
Q 11 (B)	Find the total differentiation coefficient of x^2y with respect to x when x, y are connected by $x^2+xy+y^2=1$.	**10**	**CO 2**