Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, July 2020

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) : 11

PART A

(All questions are compulsory)

1. **PART A** contains **25** questions for a total of 60 marks.
2. You need to answer **PART A** within the slot from **10:00** AM to **1:00** PM on **12th July 2020**.
3. The due time for **PART A** is **1:00** PM on **12th July 2020**.
4. After the due time, the **PART A** will not be available.

S. No.		Marks	CO
Q 1. A	Which of the following statements is/are incorrect A. The identity function is continuous B. The constant function is constant C. Every differential function is continuous. D. Every continuous function is differential.	2	CO 1

Q 1. B	What should be the value of a such that the function f is contir $$f(x) = \begin{cases} \frac{a\cos x}{\frac{\pi}{2} - x}, if\ x \neq \pi/ \\ 1, \quad if\ x = \pi/2 \end{cases}$$ A. 1 B. 2 C. 3 D. 4	3	CO 1
Q 1.C	The function $f(x) = \frac{4 - x^2}{4x - x^3}$ is A. discontinuous at only one point B. discontinuous at exactly two points C. discontinuous at exactly three points D. none of these	3	CO 1
Q 1. D	If $x = a\,t^2$ and $y = 2at$ then dy/dx is *A.* t B. $1/t$ C. $2/t$ D. t^2	3	CO 1

Q 1. E	Let $f(x) = \lvert \sin x \rvert$, Then A. $f(x)$ is everywhere differentiable. B. $f(x)$ is everywhere continuous but not differentiable C. $f(x)$ is everywhere continuous but not differentiable D. none of these	**2**	**CO1**
Q 1. F	Derivative of *sin* (*cos x*) is A. *tan* (*cos x*) B. – *cos* (*cos x*) *sin x* *C.* *tan x* *D.* *cot x*	**3**	**CO 1**
Q 1. G	The derivative of *sin x* with respect to *cos x* is A. *Sec* 2*x* B. –*tan x* C. –*cosec* 2*x* D. –*cot x*	**2**	**CO 1**
Q 1. H	If $f(x, y, z) = x^2 + xyz + z^4$, then f_x at (1, 1, 1) is A. 0 B. 1 C. 3 D. -1	**3**	**CO 2**

Q 1. I	$\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+y^2}$ is equal to A. -1 B. 0 C. 2 D. the limit does not exist	**3**	**CO 2**
Q 1. J	For a homogeneous function if critical points exist the valu A. 1 B. equal to its degree C. 0 D. -1	**3**	**CO 2**
Q 1. K	For homogeneous function with no saddle points we must ha A. 90 B. 1 C. equal to degree D. 0	**3**	**CO 2**
Q 1. L	For homogeneous function the linear combination of rates o axes is A. Integral multiple of function value B. no relation to function value C. real multiple of function value D. depends if the function is a polynomial	**2**	**CO 2**

Q 1. M	If $u = \dfrac{\left(\sqrt{x}+\sqrt{y}\right)\sin^{-1}\left(\dfrac{y}{x}\right)}{x^3+y^3}$ then value of $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}$ is A. -2.5 u B. -1.5 C. 0 D. 0.5 u	**2**	**CO 2**
Q 1. N	The value of 'c' of Rolle's Theorem for the function $f(x)$ = A. $\pi/2$ B. $\pi/6$ C. $\pi/2$ D. 0	**2**	**CO 3**
Q 1. O	If $f(a)$ is equals to $f(b)$ in Mean Value Theorem, then it bec A. Morera's Theorem B. Rolle's Theorem C. Taylor Series of a function D. Leibnitz theorem	**2**	**CO 3**

Q 1. P	Mean Value theorem is applicable to the A. Functions differentiable in closed interval [a, b] and B. Functions continuous in closed interval [a, b] only ar 'b' C. Functions continuous in closed interval [a, b] and dif D. Functions differentiable in open interval (a, b) only a and 'b'	**2**	**CO 3**
Q 1. Q	To find the value of *sin* (9) the Taylor Series expansion shou A. 9 B. 8 C. 7 D. Some delta (small) interval around 9	**2**	**CO 3**
Q 1. R	$\lim_{x\to 0} \frac{\sin(\sin x)}{x}$ is A. 1 B. ∞ C. 0 D. -1	**2**	**CO 3**

Q 1. S	Value of $\lim_{x\to 0}(1+\sin x)^{\cos ecx}$ is *A.* e B. 0 C. 1 D. ∞	**2**	**CO 3**
Q 1. T	The curvature of a function $f(x)$ is zero. Which of the follow A. $ax + b$ B. $ax^2 + bx + c$ *C.* $\sin x$ D. $\cos x$	**3**	**CO 4**
Q 1. U	The curve represented by the equation $a^2x^2 = y^3(2a - y)$ is A. symmetrical about x–axis and passing through ($2a$, 0 B. symmetrical about both x–axis and y–axis and passi C. symmetrical about y–axis and passing through (0, $2a$) D. symmetrical about both x–axis and y–axis and passin	**2**	**CO 4**

Q 1. V	The equation of tangents to the curve at origin represented b A. $y = 0,\ y = 0$ B. $x = 0, x = 2a$ C. $x = 0,\ x = 0$ D. $x = 2a,\ x = 2a$	**2**	**CO 4**
Q 1. W	The equation of asymptotes parallel to y-axis to the curve repre $y(1 + x^2) = x$ is A. $x = 1,\ x = -1$ B. $x = 0$ C. $y = x$ D. $y = 0$	**2**	**CO 4**
Q 1. X	The curve represented by the equation $ay^2 = (x - a)(x - 5a$ A. Symmetric about x- axis and not passing through or B. Symmetric about y- axis and passing through origir C. Symmetric about x- axis and passing through origir D. Symmetric about y- axis and not passing through or	**3**	**CO 4**

Q 1. Y	The equation of tangent to the curve at origin represented by t A. $y = x$ B. $y = -x$ C. $x = 1, x = -1$ D. $y = 0$	**2**	**CO 4**

SECTION B

(All questions are compulsory)

1. The link for PART B will be available from 10:00 AM on 12th July 2020 to 10:00 AM on 13th July 2020.
2. Solve the problems in **PART B** on a plain A4 sheets and write your name, roll number and SAP ID on each page and then scan them into a single PDF file. Name the file as **SAP ID _BRANCH NAME_ROLL NUMBER** (for example: 500077624_CCVT_ R103219023.pdf) and upload that PDF file through the link provided over there.
3. **PART B** solutions sent through WhatsApp or email will not be entertained.

Q 2	Show that for all $x > 0$, $1 - x < e^{-x} < 1 - x + x^2/2$.	**8**	**CO 1**
Q 3	Prove that, if f is derivable at c and $f(c) \neq 0$ then the function $1/f$ is also derivable thereat and $\left(\frac{1}{f}\right)'(c) = \frac{-f(c)}{\{f(c)\}^2}$	**8**	**CO 2**
Q 4	Find the n^{th} derivative of y where $y = e^{ax}.\ Cos\ (bx+c)$.	**8**	**CO 3**
Q 5	Find the total differentiation coefficient of x^2y with respect to x when x, y are connected by $x^2 + xy + y^2 = 1$.	**8**	**CO 4**
Q 6	Find the asymptotes of the curve $(2x + 3)\ y = (x-1)^2$.	**8**	**CO 4**