Charotar University of Science and Technology [CHARUSAT]
Faculty of Technology and Engineering
Department of Mathematical Sciences
MA143 Engineering Mathematics I
<u>**First Sessional Exam(Online)**</u>

Semester: 1st Sem. B. Tech. (All Branch)   **Maximum Marks: 30**
<u>**Date   : 21/12/2020 (Monday)**</u>   <u>**Time: 10:00 am to 11:00 am**</u>

Instructions:
(i) Figures to the right indicate *full* marks.
(ii) Use of scientific calculator is allowed.
(iii)Draw figure where it is required.

Q-1	Choose the correct answer from the given options in the following:			[06]
1.	Which of the following statement is not true?			
	(a)	The set $A = \{1,4,9,\dots\}$ is in Roster form.		
	(b)	The function $f(x) = x + 1$ is continuous in $\mathbb{R}$		
	(c)	The set $A = \{x : x \text{ is multiple of } 4, x \text{ is an even number}\}$ is null set.		
	(d)	The function $f(x) = |x|$ is not differentiable at $x = 0$.		
2.	Which of the following function is not satisfy the conditions of the Lagrange mean value theorem in the interval [-1,1]?			
	(a)	$f(x) = |x|$	(b)	$f(x) = x^3$
	(c)	$f(x) = sin\ x$	(d)	$f(x) = x^2 + 2$
3.	If $y = (ax + b)^m$ then $y_n = 0$ for the condition _____.			
	(a)	$m > n > 0$	(b)	$m = -1$
	(c)	$n > m > 0$	(d)	$m = n$
4.	If $\begin{pmatrix} 5 & k+2 \\ k+1 & -2 \end{pmatrix} = \begin{pmatrix} k+3 & 4 \\ 3 & -k \end{pmatrix}$, then $k =$ _____.			
	(a)	-2	(b)	0
	(c)	1	(d)	2
5.	The rank of any 2×2 nonsingular matrix is_____.			
	(a)	0	(b)	1
	(c)	2	(d)	3
6.	Which of the following matrix is not in row-echelon form ?			
	(a)	$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$	(b)	$\begin{pmatrix} 1 & 1 & 2 \\ 1 & 0 & 2 \end{pmatrix}$
	(c)	$\begin{pmatrix} 1 & 2 \\ 0 & 0 \end{pmatrix}$	(d)	$\begin{pmatrix} 0 & 1 & 2 \\ 0 & 0 & 1 \end{pmatrix}$

Q-2	Attempt any Three.	[12]
(a)	Find the nth order derivative of the function $y = e^{3x} \sin x \cos 2x$.	
(b)	Check whether the Mean Value Theorem can be applied to the function $x^3 + 12x^2 + 7x$ on the closed interval [-4,4]. If so, find a value of c which satisfies the Mean value theorem in (-4, 4).	
(c)	Find the extreme values of the function $f(x) = -2x^2 + 4x + 1$.	

(d)	If $y = a\cos(\log x) + b\sin(\log x)$, show that $x^2 y_{n+2} + (2n + 1)xy_{n+1} + (n^2 + 1)y_n = 0$.	
Q-3	**Attempt any Three.**	**[12]**
(a)	Determine the rank of $\begin{pmatrix} 1 & 0 & 0 \\ 0 & a & 1 \\ 0 & 1 & a \end{pmatrix}$ using minors.	
(b)	Reduce the matrix $\begin{pmatrix} 1 & 4 & 3 & -1 \\ 2 & 0 & 3 & 1 \\ 4 & 8 & 9 & -1 \end{pmatrix}$ to reduced row-echelon form and hence determine the rank.	
(c)	Find the inverse of $\begin{pmatrix} -1 & -3 & 3 & -1 \\ 1 & 1 & -1 & 0 \\ 2 & -5 & 2 & -3 \\ -1 & 1 & 0 & 1 \end{pmatrix}$ by Gauss-Jordan method, if exists.	
(d)	Find the value of k so that the system: $x + y + 3z = 0$ $4x + 3y + kz = 0$ $2x + y + 2z = 0$ has non-trivial solution.	

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