DIT UNIVERSITY DEHRADUN	
MID TERM EXAMINATION, ODD SEMESTER 2020-21 (SEMESTER I)	
Name of Program	**B. Tech. (ALL) I YEAR**
Subject Name: Engineering Mathematics –I	**Subject Code:** MAF101
Time: 0.5 Hour	
Note: All questions carry equal weightage	
Press Submit Button after completion of Examination	
Name of Course Coordinator and Department	Dr. Jogendra Kumar Mathematics

1. The limit of $\lim_{x\to 2}(x-2)\sin(\frac{1}{x-2})$ is

   a) 0

   b) 1

   c) -2 to 2

   d) Does not exist

   Answer: a

2. Which of the following form is not indeterminate form

   a) $\frac{\infty}{\infty}$

   b) $0\times\infty$

   c) 1^0

   d) 0^0

   Answer: c

3. The value of p for which the function $f(x)=\begin{cases} x^p\cos\left(\frac{1}{x}\right), & x\neq 0 \\ 0, & x=0 \end{cases}$, is differentiable, is

   a) $p=0$

   b) $p\geq 1$

   c) $p\geq 2$

   d) Never differentiable

Answer: c

4. The value of $\lim_{x\to\infty} \frac{e^x}{x^n}$, where *n* is positive integer, is

   a) ∞

   b) n

   c) e

   d) $None$ of these

   Answer: a

5. Choose correct option

   a) function $e^{\left(-\frac{1}{x}\right)}$ is not defined at x=0

   b) function $e^{\left(-\frac{1}{x}\right)}$ is not continuous at x=0

   c) function $e^{\left(-\frac{1}{x}\right)}$ is continuous but not differentiable at x=0

   d) None of these

   Answer: b

6. If $y = (ax+b)^{-1}$, then its n^{th} derivative y_n is

   a) $(-1)^n n!\, a^n (ax+b)^{-1+n}$

   b) $(-1)^{n-1}(n-1)!\, a^n (ax+b)^{-1}$

   c) $n!\, a^n (ax+b)^{-1-n}$

   d) $None$

   Answer: d

7. The n^{th} derivative of $y = \cos(5x+2)$ is

   a) $y_n = \cos(5^n x + 2)$

   b) $y_n = 5^n \cos\left(5x + 2 + \frac{(n-1)\pi}{2}\right)$

   c) $y_n = 5^n \cos\left(5x + 2 + \frac{n\pi}{2}\right)$

   d) $y_n = \frac{(-1)^{n-1}}{5^n} \cos(5x+2)$

   Answer: c

8. The $(n-1)^{th}$ derivative of $y = \log(3x-1)$ is

a) $y_{n-1} = (-1)^{n-2}(n-2)!\,3^{n-1}(3x-1)^{-(n-1)}$

b) $y_{n-1} = (-1)^{n-1}(n-1)!\,3^{n-1}(3x-1)^{-(n-1)}$

c) $y_{n-1} = (-1)^{n-1}(n-1)!\,3^{n}(3x-1)^{-(n-1)}$

d) $y_{n-1} = (-1)^{n-1}(n-1)!\,3^{n}(3x-1)^{-n}$

Answer: a

9. The n^{th} derivative of $y = e^{3x}\cos(5x+2)$ is

a) $y_n = (34)^{1/2}\, e^{3x}\cos\left(5x + 2 + n\, tan^{-1}\left(\frac{5}{3}\right)\right)$

b) $y_n = (34)^{n/2}\, e^{3x}\cos\left(5x + 2 + n\, tan^{-1}\left(\frac{5}{3}\right)\right)$

c) $y_n = (34)^{3/2}\, e^{3x}\cos\left(5x + 2 + n\, tan^{-1}\left(\frac{5}{3}\right)\right)$

d) $y_n = (34)^{1/2}\, e^{3x}\cos\left(5x + 2 - n\, tan^{-1}\left(\frac{3}{5}\right)\right)$

Answer: b

10. Leibnitz's theorem is used

a) To evaluate limit of a function

b) To evaluate integral of product of three functions

c) To find differentiation of product of two functions

d) To examine continuity of a function

Answer: c

11. The Taylor's series expansion of $log(1+x)$ is equal to:

a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + - - -$

b) $x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + - - -$

c) $x - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} \pm - -$

d) $x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + - - -$

Answer: a

12. Taylor's series expansion of $y = \frac{1}{x}\ about\ x = 1$ is equal to

a) $1 + (x-1) + (x-1)^2 + (x-1)^3 + ---$

b) $1 - (x-1) + (x-1)^2 - (x-1)^3 + ---$

c) $1 - (x+1) + (x+1)^2 - (x+1)^3 + ---$

d) None

Answer: b

13. Taylor's series expansion of f(x) about 1 is equal to

a) $f(1) + \frac{x-1}{1!}f'(1) + \frac{(x-1)^2}{2!}f''(1) +$------

b) $f(1) + \frac{x+1}{1!}f'(1) + \frac{(x+1)^2}{2!}f''(1) +$------

c) $f(1) + \frac{x}{1!}f'(1) + \frac{(x)^2}{2!}f''(1) +$------

d) $f(0) + \frac{x-1}{1!}f'(0) + \frac{(x-1)^2}{2!}f''(0) +$------

Answer: a

14. The Taylor's series expansion of $\cos x$ is equal to

a) $\frac{x^2}{2} - \frac{x^4}{4} \pm --$

b) $1 - \frac{x^2}{2} + \frac{x^4}{4} \pm --$

c) $1 - \frac{x^2}{2!} + \frac{x^4}{4!} \pm --$

d) $1 + \frac{x^2}{2!} + \frac{x^4}{4!} + ---$

Answer: c

15. The Taylor's series expansion of $x^{8/3}$ in the neighborhood of $x = 0$ is:

a) $x + \frac{x^{\frac{1}{3}}}{3!} + \frac{x^{\frac{1}{9}}}{6!} + --$

b) $x - \frac{x^{\frac{1}{3}}}{3!} + \frac{x^{\frac{1}{9}}}{6!} + --$

c) $x - \frac{x^{\frac{1}{3}}}{2!} - \frac{x^{\frac{1}{9}}}{3!} + --$

d) None

Answer: d

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B.TECH (ALL) I YEAR	**MID TERM EXAMINATION, ODD SEM 2020-21 (SEM I)**
Subject Name: Engineering Mathematics -I	
Name of Course Coordinator and Department:	Dr. Jogendra Kumar, Mathematics
Time: 1 Hour	**Total Marks:** 15

Note: All questions are compulsory. Students are advised to solve all Questions and covert			
Q.1)	**Attempt all Parts :**		
	(a)	Let $f(x)=\begin{cases} a+bx\ , & x<1 \\ 4\ , & x=1 \\ b-ax\ , & x>1 \end{cases}$ If $\lim_{x\to1} f(x) = f(1)$, find a and b .	
	(b)	Find the n^{th} derivative of $y=\dfrac{3x}{(x-1)(x+2)}$.	
		[2 x 2.5= 5]	
Q.2)		If $y = tan^{-1}x$, prove that $(1+x^2)y_2 + 2xy_1 = 0$ and deduce that $(1+x^2)y_{n+2} + 2(n+1)xy_{n+1} + n(n+1)y_n = 0$.	
		[1 x 5= 5]	
Q.3)		Use Taylor's series to expand the polynomial function $f(x) = x^4 - 3x^3$ in powers of $(x-2)$. Hence find the value of (2.1) .	
		[1 x 5= 5]	

-----END OF PAPER ----