## LOYOLA COLLEGE (AUTONOMOUS), CHENNAI - 600 034



**U.G.** DEGREE EXAMINATION – **ALLIED** 

FIRST SEMESTER – **NOVEMBER 2023** 

## UMT 1303 - MATHEMATICS FOR STATISTICS - I

Dept. No. Date: 09-11-2023 Time: 09:00 AM - 12:00 NOON

Max.: 100 Marks

SECTION A - K1 (CO1)				
	Answer ALL the Questions(10 x 1 = 10)			
1.	Answer the following			
a)	What is the product rule in differentiation?			
b)	Define a critical point of a function.			
c)	State Euler's theorem.			
d)	Describe integration by parts.			
e)	List any two applications of integral calculus.         Fill in the blanks			
2.				
a)	In implicit differentiation, differentiating both sides of an implicit equation with respect to the variable is the initial step.			
b)	If the second derivative of a function is positive at a specific point, the function has a local			
	at that point.			
c)	The partial derivative of a function with respect to a variable means that the of the function concerning that variable			
<u>(b</u>				
u)	The integral of $\frac{1}{\sqrt{x}}$ with respect to x is			
e)	The definite integral of $\frac{1}{x}$ from 1 to e is			
	SECTION A - K2 (CO1)			
	Answer ALL the Questions(10 x 1 = 10)			
3.	Choose the correct answer			
a)	If $f(x) = \tan x$ , what is $f'(x)$ ?			
	(i) $\cos^2 x$			
	(ii) $sec^2x$			
	(iii) cot x			
	(iv) $sin^2x$			
b)	Leibnitz theorem provides a formula to find			
	(i) The $n^{th}$ derivative of a sum of two functions			
	(ii) The $n^{th}$ derivative of a product of two functions			
	(iii) The integral of a product of two functions			
	(iv) The integral of a sum of two functions			
c)	What is a partial differential equation?			
	(i) An advation involving only nomial derivatives of a function			
	(1) An equation involving only partial derivatives of a function.			
	<ul><li>(ii) An equation involving only ordinary derivatives of a function.</li></ul>			
	<ul><li>(ii) An equation involving only ordinary derivatives of a function.</li><li>(iii) An equation involving both partial and ordinary derivatives of a function.</li></ul>			
	<ul> <li>(i) An equation involving only ordinary derivatives of a function.</li> <li>(ii) An equation involving both partial and ordinary derivatives of a function.</li> <li>(iii) An equation involving both partial and ordinary derivatives of a function.</li> <li>(iv) An equation involving only algebraic expressions.</li> </ul>			

d)	Which of the following integrals represent integration of a rational algebraic function?	)	
	(i) $\int e^x dx$		
	(ii) $\int \frac{1}{x^2+1} dx$		
	(iii) $\int \frac{x^2 + 3x - 2}{2} dx$		
	$(iv) \int sinr dr$		
e)	The value of the definite integral $\int_{2}^{\pi} \sin r  dr$ is		
	(i) 0		
	(i) 0 (ii) 1		
	(iii) π		
	(iv) 2		
4.	State true or false		
a)	The derivative of a constant multiplied by a function $k. f(x)$ is $k. f'(x)$ .		
b)	If a function is concave downwards on an interval, then the second derivative is positi	ve.	
c)	If a function $f(x, y)$ is independent of the variable y, then $\frac{\partial f}{\partial y} = y$		
d)	The integral of a function over an interval cannot be negative.		
e)	If $F(X)$ is an antiderivative of $f(x)$ , then $\int_a^b f(x)dx = F(b) - F(a)$ .		
SECTION B - K3 (CO2)			
Ans	wer any TWO of the following	$(2 \times 10 = 20)$	
5.	Apply Leibnitz theorem to compute $n^{th}$ derivative of $x^2 e^{5x}$ .		
6.	Produce $y_n$ when $y = \frac{3}{(x+1)(2x-1)}$ by resolving into partial fractions.		
7.	Determine $\int \frac{x^{24}}{x^{10}+1} dx.$		
8.	Using partial fraction method, compute $\int \frac{2dx}{(1-x)(1+x^2)}$		
SECTION C – K4 (CO3)			
Ans	wer any TWO of the following	$(2 \times 10 = 20)$	
9.	Examine Euler's theorem when $u = x^3 + y^3 + z^3 + 3xyz$ .		
10.	Illustrate the theorem that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$ when u is equal to $\log\left(\frac{x^2 + y^2}{xy}\right)$ .		
11.	Test any three properties of definite integral.		
12.	Determine $\int \frac{dx}{(3+x)\sqrt{x}}$		
SECTION D – K5 (CO4)			
Ans	wer any ONE of the following	$(1 \times 20 = 20)$	
13.	(i) If $y = \sin(msin^{-1}x)$ , Defend that $(1 - x^2)y_2 - xy_1 + m^2y = 0$ . (ii) Predict $n^{th}$ differential coefficient of $x^2 \log x$ .		
14.	(i) Evaluate $\int (3x-2)\sqrt{x^2+x+1}  dx$ .		
	(ii) Compute $\int \frac{x+4}{6x-7-x^2} dx$		
	SECTION E – K6 (CO5)	(1 20 20)	
Ansv 15	wer any UNE of the following $A_{space the maximum and minimum values of the function 2x^3 - 2x^2 - 26x + 10$	$(1 \times 20 = 20)$	
15.	Assess the maximum and minimum values of the function $2x^2 - 3x^2 - 30x + 10$ . (i) Compile reduction formula for $\int \cos^n x  dx$ and hence evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^8 x  dx$	(10 marks)	
	(i) complete duction formula for j cos x ux and hence evaluate $\int_0^{\pi} \cos x  dx$ .		
	(11) Test that $\int_0^2 \frac{1}{(\sin x)^2 + (\cos x)^2} dx = \frac{1}{4}$	(10 marks)	
&&&&&&&			