LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

U.G. DEGREE EXAMINATION – **ALLIED**

FIRST SEMESTER – **NOVEMBER 2024**

UMT1AR03 – MATHEMATICS FOR STATISTICS I

Date: 20-11-2024 Dept. No. Max. : 100 Marks

Time: 09:00 am-12:00 pm

SECTION A - K1 & K2 (CO1)		
Q.No	Levels	**Answer ALL the Questions** **(10 x 2 = 20)**
1	K1	Define differentiability of f at x.
2		State Euler's theorem.
3		Define order and degree of a differential equation.
4		Recall and write any two methods of integration.
5		Define gamma function.
6	K2	Find the derivative of $y=x^2+2\sin x+3\cos x$ with respect to x.
7		Write the procedure to find maximum value of $f(x)$.
8		State the condition for the differential equation $M\,dx+N\,dy=0$ to be exact.
9		Find $\int \cos^3 x \sin x dx$.
10		Write the formula for $\int_o^{\frac{\pi}{2}} \cos^n x dx$.
SECTION B – K3 & K4 (CO2)		
		Answer ALL the Questions **(4 x 10 = 40)**
11	K3	Evaluate $\frac{dy}{dx}=\sec x$ if $y=\log\sqrt{\frac{1+\sin x}{1-\sin x}}$.
		[OR]
12		Verify that $f_{xy}=f_{yx}$, when $f=x^y$.
13		If $f=x^3+y^3+z^3+3xyz$, determine $f_x, f_{xx}, f_y, f_{xyz}$
		[OR]
14		Select suitable method and solve the differential equation $\frac{dy}{dx}+y\cos x=\frac{1}{2}\sin 2x$.
15	K4	Point out the appropriate property of finite integral and evaluate $\int_0^{\frac{\pi}{2}} \log \sin x\, dx$
		[OR]
16		State and prove any three properties of definite integrals.
17		With usual notations, show the following: (i) $\Gamma(n+1)=n!$. (ii) $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$.

		[OR]
18		Prove that the function $y=x e^{\frac{-1}{2}x^2}$ satisfies the equation $x\frac{dy}{dx}=(1-x^2)y$.

SECTION C – K5 & K6 (CO3)		
	Answer ALL the Questions	**(2 x 20 = 40)**
19	K5	(a) Evaluate: $\int_0^{\frac{\pi}{4}} \log ¿¿$. (b) Evaluate: $\int \frac{(x+7)}{x^2+4x+13}dx$. (10+10)
		[OR]
20		Choose right method to find the general solution of the differential equation $(D^2+4D+5)y=e^x+x^2+\cos 2x$ and solve it.
21	K6	(a) If $v=r^m$ where $r^2=x^2+y^2+z^2$, defend that $\frac{\partial^2 v}{\partial x^2}+\frac{\partial^2 v}{\partial y^2}+\frac{\partial^2 v}{\partial z^2}=m(m+1)r^{m-2}$. (b) Determine the first derivative of the following function with respect to x (i) $y=3\log x+3\sqrt{x}-\left(\frac{1}{x}\right)+2\tan x$ (ii) $y=x e^x \sin x$ (13+7)
		[OR]
22		Derive the relation between beta and gamma functions.

$$$$$$$$$$$$$$$$