Department of Applied Sciences & Humanities
Faculty of Engineering & Technology
B. Tech. Semester- I
Engineering Mathematics -1
End Semester Examination 2023-24

Course Name & Paper Code: Engineering Mathematics -1& ASB -103   **Sections:** All Sections

Maximum Marks: 45   **Duration:** 3 Hours

Instruction to the candidates
· Write your Roll No. on the top immediately on receipt of the question paper.
· Avoid circumlocution.

Note: Attempt any two parts from each question. All questions carry equal marks

Q. No.	Questions	Marks	CO
	Unit - 1		
Q1.			
(a)	If $y = \left[log \left\{ x + \sqrt{(1+x^2)} \right\} \right]^2$, then find y_n at $x = 0$.	4.5	CO-1
(b)	Obtain the asymptotes of the curve $x^3 + x^2y - xy^2 - y^3 - 2x^2 + 2y^2 + x + y + 1 = 0$.	4.5	CO-1
(c)	Trace the curve $y^2(x+a) = x^2(a-x)$.	4.5	CO-1
	Unit - 2		
Q2.			
(a)	Evaluate $\int_0^a \frac{log\,(1+ax)}{1+x^2} dx$ and hence show that $\int_0^1 \frac{log(1+x)}{1+x^2} dx = \frac{\pi}{8} log\,2$.	4.5	CO-2
(b)	Obtain the points on $z^2 = xy + 1$ nearest to the origin.	4.5	CO-2
(c)	Verify Euler's theorem for the functions (a) $z = \tan^{-1}\left(\frac{y}{x}\right)$ and (b) $z = x^n log\left(\frac{y}{x}\right)$.	4.5	CO-2

		Unit - 3		
Q3.				
(a)		Change the order of integration in double integral $\int\limits_{0}^{1}\int\limits_{y}^{1} x^2 \cos\left(x^2 - xy\right) dy\, dx$, and hence obtain its value.	4.5	CO-3
(b)		Prove that $\int\limits_{0}^{\infty} \frac{x^{p-1}}{1+x}\, dx = \frac{\pi}{\sin p\pi}, 0 < p < 1$.	4.5	CO-3
(c)		Obtain the arc length of (i) the curve $y = \log \sec x$ between the points $x = 0$ and $x = \frac{\pi}{3}$, and (ii) the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$.	4.5	CO-3
		Unit – 4		
Q4.				
(a)		Solve the equation $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = \log x . \sin (\log x)$.	4.5	CO-4
(b)		Solve the equation $(1+x)^2 \frac{d^2 y}{dx^2} + (1+x)\frac{dy}{dx} + y = 4\cos\left\{\log(1+x)\right\}$.	4.5	CO-4
(c)		Solve the equations (a) $(D^2 - 3\,D + 2)\, y = \cos 3x$ and (b) $(D^2 + 4\,D + 4)\, y = x^3\, e^{2x}$.	4.5	CO-4
		Unit - 5		
Q5.				
(a)		Solve the equations (a) $(x^2 - y^2 - z^2)p + 2xyq = 2xz$ and (b) $2p + 3q = 1$.	4.5	CO-5
(b)		Solve the equation $(p^2 + q^2)y = qz$.	4.5	CO-5
(c)		Solve $\frac{\partial^2 z}{\partial x\, \partial y} = \sin x \sin y$, given that $\frac{\partial z}{\partial y} = -2 \sin y$, when $x = 0$ and $z = 0$, when y is an odd multiple of $\frac{\pi}{2}$.	4.5	CO-5