MSc(SS) DEGREE EXAMINATION MAY 2026

(First Semester)

Branch – **SOFTWARE SYSTEMS (Five Year integrated)**

CALCULUS AND ITS APPLICATIONS

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	If $f(x) = x + 5,\ g(x) = x - 3$ what is the value of $g(f(0))$? a) 5 b) 0 c) 2 d) -3	K1	CO1
	2	Write the value of $\lim_{x\to 0} \frac{sin2x}{5x}$ a)2/5 b)5/2 c) 0 d)∞	K2	CO1
2	3	The series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ _____ a)converges b) diverges c) neither converges nor diverges d)both convergent and divergent	K1	CO2
	4	Compute the value of $\sum_{n=0}^{\infty} \frac{4}{2^n}$? a)4 b)2 c)1 d)8	K2	CO2
3	5	If $f(x, y, z) = xy + yz + zx$, What is f_{yxz} ? a) 1 b) 4 c) 2 d)0	K1	CO3
	6	If $w = x^2 + y^2, x = r - s, y = r + s.$ Estimate $\frac{\partial w}{\partial r}$ a)$4s$ b)$4r$ c)$4x$ d)$4y$	K2	CO3
4	7	The ODE $y' + p(x)y = r(x)$ is said to be homogeneous if $r(x)$ _____ a) $=0$ b) $\neq 0$ c) $= p(x)$ d) $\neq p(x)$	K1	CO4
	8	The equation $-cydx + 2xdy = 0$ is exact if c= a)1 b)-2 c)-1 d)2	K2	CO4
5	9	The Fourier coefficients can be found using _____ formula a) Euler's b) Lagrange's c) Cauchy's d) Poission's	K1	CO5
	10	The function $f(x) = x + x^2$ in$(-\pi,\pi)$ is _____ a) even b) odd c) neither even nor odd d) both even and odd	K2	CO5

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Discuss the behavior of $f(x) = \frac{x^2-1}{x-1}$ near x=1.	K2	CO1
		(OR)		

Cont....

1	11.b.	Characterize the scaling and reflection of the function $y = \sqrt{x}$ graphically.	K2	CO1
2	12.a.	Using comparison test discuss the convergence of $\sqrt{\frac{n+1}{n^2+2}}$	K2	CO2
		(OR)		
	12.b.	Infer for what values of x the power series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}x^n}{n}$ converges		
3	13.a.	Discuss the continuity of $f(x,y) = \begin{cases} \frac{2xy}{x^2+y^2} & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$	K2	CO3
		(OR)		
	13.b.	Compute the tangent plane and normal line of the level surface $f(x,y,z) = x^2 + y^2 + z - 9 = 0$ at the point(1,2,4)		
4	14.a.	Set a model for Radio activity-Exponential decay Given an amount of a radioactive substance, say, 0.5 g (gram), find the amount present at any later time.	K4	CO4
		(OR)		
	14.b.	Elobrate on "Population dynamics"		
5	15.a.	calculate a_0, a_n in the fourier series expansion of the square wave function $f(x) = \begin{cases} 0 & in -4 < x < 0 \\ 5 & in \quad 0 < x < 4 \end{cases}$	K3	CO5
		(OR)		
	15.b.	Calculate the half range fourier sine series expansion of the function $f(x) = ax + b \; in \; 0 < x < l$		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Evaluate $\lim_{x\to 1} \frac{x^2+x-2}{x^2-x}$ and $\lim_{x\to 0} \frac{\sqrt{x^2+100}-10}{x^2}$	K2	CO1
2	17	Discuss the convergence of the p series $\sum_{n=1}^{\infty} \frac{1}{n^p}$	K2	CO2
3	18	A company manufactures stainless steel right circular cylindrical molasses storage tanks that are 25 ft high with a radius of 5 ft. How sensitive are the tanks' volumes to small variations in height and radius? If the values are reversed discuss the change.	K2	CO3
4	19	Identify the solution of $(x^2 + y^2 + x)dx + xydy = 0$	K4	CO4
5	20	If $f(x) = \frac{\pi - x}{2}$, then derive the Fourier series expansion in the interval $(0,2\pi)$ and hence find $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$	K3	CO5

Z-Z-Z END