LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.C.A. DEGREE EXAMINATION – **COMPUTER APPLICATIONS**

FOURTH SEMESTER – **APRIL 2023**

UMT 4405 – MATHEMATICS FOR COMPUTER APPLICATIONS

Date: 04-05-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

	SECTION A - K1 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
1.	**Answer the following**	
a)	Express $\cos\theta$ in terms of ascending powers of θ.	
b)	State Euler's theorem.	
c)	When do you say a given matrix is orthogonal?	
d)	What do you mean by reciprocal equation?	
e)	Define the term interpolation.	
2.	**Fill in the blanks**	
a)	The expansion of $\tan 7\theta$ is _____.	
b)	Every square matrix satisfies its own _____.	
c)	The polynomial function $f(x)$ when divided by $x-a$ yields the remainder as _____.	
d)	If $z=f(u)$, where u is a function of x and y, then $\frac{\partial z}{\partial x}=$ _____.	
e)	The Simpson's one-third rule formula is given by _____.	
	SECTION A - K2 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
3.	**MCQ**	
a)	$2\sinh x\cosh x=$ (i) $\sinh 2x$ (ii) $\cosh 2x$ (iii) $\tanh 2x$ (iv) $\operatorname{sech} 2x$	
b)	A root of $f(x)=0$ is said to lie between a and b if (i)$f(a),f(b)>0$ (ii) $f(a),f(b)<0$ (iii) $f(a)>0,f(b)<0$ (iv) $f(a),f(b)=0$	
c)	The eigen values of the matrix $\begin{bmatrix}8 & -4\\ 2 & 2\end{bmatrix}$ are (i) 4,3 (ii) 6,4 (iii) 6,3 (iv) 3,3	
d)	The first order partial differential coefficients of $u=\sin(ax+by)$ with respect to x is (i) a $\cos(ax+by)$ (ii) b $\cos(ax+by)$ (iii) $-$ b $\cos(ax+by)$ (iv)$-$a $\cos(ax+by)$	
e)	In Newton Raphson method if the curve $f(x)$ is constant, then (i)$f(x)=0$ (ii) $f'(x)=0$ (iii) $f(x)=c$ (iv) $f''(x)=0$	
4.	**True or False**	
a)	$\log\left(x+\sqrt{x^2+1}\right)=\sinh^{-1}x.$	
b)	If α is a root of a reciprocal equation then $1/\alpha$ is also its root.	

c)	The rank of the matrix $\begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ is 1.
d)	The function $x^2 + y$ is a homogeneous function.
e)	The order of convergence of Newton Raphson method is 2.

SECTION B - K3 (CO2)

	Answer any TWO of the following (2 x 10 = 20)
5.	Organize $\frac{\sin 6\theta}{\sin\theta}$ in terms of $cos\ \theta$.
6.	Establish the validity of the relation $p^3 + 8r = 4pq$, if the sum of two roots of the equation $x^4 + px^3 + qx^2 + rx + s = 0$ equals the sum of the other two.
7.	If $u = \tan^{-1}\frac{x^3+y^3}{x-y}$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$.
8.	Determine the inverse of the matrix $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$ using Cayley Hamilton Theorem.

SECTION C – K4 (CO3)

	Answer any TWO of the following (2 x 10 = 20)
9.	Given that $cos\ a\ cosh\ b = cos\ c$ and $sin\ a\ sinh\ b = sin\ c$, formulate the relation $sin\ c = \pm sin2\ a = \pm sinh2\ b$.
10.	Identify the equation with rational coefficients one of whose roots is $\sqrt{5} + \sqrt{2}$.
11.	If $V = (x^2 + y^2 + z^2)^{-1/2}$, then determine the value of $\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2}$.
12.	Estimate the first and second order derivatives of $f(x)$ at $x = 1.5$ if

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.000	13.625	24.000	38.875	59.000

SECTION D – K5 (CO4)

	Answer any ONE of the following (1 x 20 = 20)
13.	(a) Defend the relation $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial r}\right)^2 + \frac{1}{r^2}\left(\frac{\partial z}{\partial \theta}\right)^2$, where $z = f(x, y)$ and $x = r\cos\theta$ and y= $r\sin\theta$. (10 marks) (b) Evaluate $\lim_{\theta \to 0}\frac{n\ sin\ \theta - \sin n\theta}{\theta(\cos\theta - \sin n\theta)}$. (10 marks)
14.	Estimate the roots of the equation $6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$.

SECTION E – K6 (CO5)

	Answer any ONE of the following (1 x 20 = 20)
15.	Solve $\int_0^{10}\frac{dx}{1+x^2}$ using (i) Trapezoidal rule (ii) Simpson's one-third rule.
16.	Diagonalize the matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

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