LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – COMPUTER SCIENCE

FOURTH SEMESTER – NOVEMBER 2024

UMT 4406 – MATHEMATICS FOR COMPUTER SCIENCE

Date: 11-11-2024   Dept. No.   Max. : 100 Marks
Time: 09:00 am-12:00 pm

	SECTION A - K1 (CO1)	
	Answer ALL the Questions -	**(10 x 1 = 10)**
1.	**Answer the following**	
a)	Find the determinant of the matrix $A=\begin{vmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{vmatrix}$.	
b)	If $y=e^{ax}$ then find y_1.	
c)	Define solenoidal vector.	
d)	What is partial differential equation?	
e)	Define complete integral.	
2.	**Fill in the blanks**	
a)	The inverse of the matrix A is denoted by _____.	
b)	The value of $\int x^2\, dx$ is _____.	
c)	If **F** is conservative, then _____.	
d)	Second order linear ODE with variable coefficients is also known as _____.	
e)	The order of the PDE $u_{xx}+2x\,u_{xy}+u_{yy}=e^y$ is _____	
	SECTION A - K2 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
3.	**MCQ**	
a)	A square matrix $A=\left(a_{ii}\right)$ is said to be a skew symmetric matrix if (i) $\left(a_{ij}\right)=\left(a_{ii}\right)$ (ii)$\left(a_{ij}\right)=\left(a_{ji}\right)$ (iii) $\left(a_{ii}\right)=-\left(a_{ii}\right)$ (iv) $\left(a_{ij}\right)=-\left(a_{ii}\right)$	
b)	If $y=\sin 3x$, then $\dfrac{dy}{dx}$ is (i) -3 cos3x (ii) cos3x (iii) -3 sin3x (iv) 3 cos3x	
c)	In the direction of the vector $2\vec{i}+2\vec{j}-\vec{k}$,the directional derivative of $\varnothing=x+x\,y^2+y\,z^3$ at (0, 1, 1) is (i) 2 (ii) 3 (iii) 5 (iv) 1	
d)	The degree of the differential equation $\dfrac{d^2 y}{dx^2}+2\dfrac{dy}{dx}+y=0$ is (i) 1 (ii) 2 (iii) 3 (iv) 4	
e)	The solution of $z=px+qy+2\sqrt{pq}$ is (i) $z=p+q+ab$ (ii) $z=ax+by+ab$ (iii) $z=ax+by+\sqrt{ab}$ (iv) $z=p+q+\sqrt{ab}$	
4.	**True or False**	
a)	A diagonal matrix is a square matrix.	
b)	One of the applications of integration is finding area.	
c)	If F is a vector field, then $\nabla \cdot F$ is a vector field.	

d)	The complementary function of $(D^2-4D+3)y=0$ is Ae^x+Be^{3x}.
e)	There is no singular integral for the equations are of the form $f(p,q)=0$.

SECTION B - K3 (CO2)	
Answer any TWO of the following	**(2 x 10 = 20)**

5.	If $A=\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then show that A satisfies the equation $A^2-5A-2I=0$.
6.	Using Bernoulli's formula determine $\int x^3 \cos 2x\, dx$.
7.	Find φ if $\nabla\varphi=(6xy+z^3)\vec{i}+(3x^2-z)\vec{j}+(3xz^2-y)\vec{k}$.
8.	Solve the differential equation $(D^2+4D+5)y=e^x+x^3$.

SECTION C – K4 (CO3)	
Answer any TWO of the following	**(2 x 10 = 20)**

9.	Find the inverse of the matrix $\begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$
10.	Evaluate maxima and minima of the function $f(x)=x^3-18x^2+96x+4$.
11.	Solve the following partial differential equations (a) $p=y^2q^2$ (b) $p(1+q^2)=q(z-1)$.
12.	Determine the solution of the equation $x^2\dfrac{d^2y}{dx^2}+x\dfrac{dy}{dx}+y=\log x$.

SECTION D – K5 (CO4)	
Answer any ONE of the following	**(1 x 20 = 20)**

13.	a) Using matrices, solve $6x+2y-2y=6$, $-2x+2y+2z=2$, $2x+2y+2z=6$. b) Evaluate $\iint xy\,dx\,dy$ taken over the quadrant of the circle $x^2+y^2=a^2$.
14.	Verify divergence theorem for $\vec{F}=(x^3-yz)\vec{i}-2x^2\vec{j}+2\vec{k}$ taken over the cube bounded by $x=0,x=a,y=0,y=a,z=0 \wedge z=a$.

SECTION E – K6 (CO5)	
Answer any ONE of the following	**(1 x 20 = 20)**

15.	Verify Stokes theorem for $\vec{A}=(2x-y)\vec{i}-yz^2\vec{j}-y^2z\vec{k}$ taken over the upper half surface of the sphere $x^2+y^2+z^2=1$, $z\geq0$ and the boundary curve C, the circle $x^2+y^2=1, z=0$.
16.	a) Solve the equation $x\dfrac{\partial z}{\partial x}=2x+y+3z$. b) Find the general solution of $(y+z)p+(z+x)q=x+y$.

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