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18CHU06

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION-DECEMBER 2022
(Second Semester)

Branch – **CHEMISTRY**

MATHEMATICS-II

Time: 3 hours　　　　　　　　　　Maximum Marks: 50

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks　　　　(5 x 1 = 5)

1. The characteristic equation of $\begin{bmatrix} -m & -n \\ 1 & 0 \end{bmatrix}$
   (a) $x^2 - mx - n = 0$　　(b) $x^2 + mx + n = 0$
   (c) $x^2 + nx + m = 0$　　(d) $x^2 + nx + mn = 0$
2. The partial differential equation of the form $Pp + Qq = R$, where P, Q and R are functions of x, y, z is called ____________
   (a) Clairaut's form　　(b) auxillary form
   (c) Charpit's form　　(d) Lagrange's equation
3. $f(x) = \frac{\pi - x}{2}$, in $(-\pi, \pi)$ then $f(x)$ is an ______
   (a) even function　　(b) odd function
   (c) both even and odd　　(d) neither even nor odd,
4. $L[t^n]$ = _________.
   (a) $\frac{n!}{S^{n-1}}$　　(b) $\frac{n!}{S^{n+1}}$
   (c) $\frac{(n-1)!}{S^{n-1}}$　　(d) $\frac{(n+1)!}{S^{n-1}}$
5. The rate of convergence in Gauss-Seidel method is roughly____________than that of Gauss-Jacobi method.
   (a) one time　　(b) two times
   (c) three times　　(d) same

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL questions carry **EQUAL** marks　　　　(5 x 3 = 15)

6. (a) Under what conditions will the real matrix $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ have (i) real eigen values (ii) eigenvalues ± 1?

   (OR)

   (b) Find the eigenvalues of the matrix $\begin{bmatrix} 2 & 0 & 4 \\ 0 & 6 & 0 \\ 4 & 0 & 2 \end{bmatrix}$.
7. (a) Eliminate the arbitrary functions f and φ from the relation.

   (OR)

   (b) Solve: $x\frac{\partial z}{\partial x} = 2x + y + 3$.

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8 a If $f(x)=\begin{cases}-x, & -\pi<x<0 \\ x, & 0<x<\pi\end{cases}$ expand $f(x)$ as a Fourier series in the interval $-\pi$ to π.

OR

b Find a sine series for $f(x)=c$ in the range 0 to π. Deduce that $\frac{\pi}{4}=1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\ldots$

9 a Find $L\left[e^{-at}\sin bt\right]$

OR

b Find $L^{-1}\left[\frac{s}{(s+3)^2+4}\right]$.

10 a Solve by Gauss-elimination method: $2x+y+4z=12;\ 8x-3y+2z=20;\ 4x+11y-z=33$.

OR

b Write the comparison of Gauss elimination and Gauss-Seidal methods.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (5 x 6 = 30)

11 a Find the characteristic equation of the matrix $A=\begin{bmatrix}1 & 0 & 2\\ 0 & 2 & 1\\ 2 & 0 & 3\end{bmatrix}$ and hence find its inverse.

OR

b Diagonalise the matrix $\begin{bmatrix}2 & 2 & 0\\ 2 & 1 & 1\\ -7 & 2 & -3\end{bmatrix}$

12 a Solve $\frac{\partial^2 z}{\partial x^2}=a^2 z$ given that when $x=0, \frac{\partial z}{\partial y}=0$.

OR

b Solve : (i) $q=xp+p^2$ (ii) $p=y^2q^2$ (iii) $p(1+q^2)=q(z-1)$.

13 a If $f(x)=\begin{cases}x, & 0<x<\pi \\ 2\pi-x, & \pi<x<2\pi\end{cases}$ express f(x) as a Fourier series in the range $(0,2\pi)$

OR

b Find a cosine series in the range 0 to π for $f(x)=\begin{cases}x, & 0<x<\pi/2 \\ \pi-x, & \pi/2<x<2\pi\end{cases}$

14 a Find $L^{-1}\left[\frac{1+2s}{(s+2)^2(s-1)^2}\right]$.

OR

b Solve the equation $\frac{d^2y}{dx^2}+4\frac{dy}{dx}+13y=2e^{-x}$ given $y=0, \frac{dy}{dx}=-1$ when $x=0$.

15 a Solve by Gauss-Jacobi method:
$27x+6y+z=85;\ 6x+15y+2z=72;\ 6x+3y+12z=35$.

OR

b Solve by Gauss-Seidal method:
$8x-3y+2z=20;\ 4x+11y-z=33;\ 6x+37+12z=35$.

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END