20PHU06 / 18PHU06

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2022
(Second Semester)

Branch – **PHYSICS**

MATHEMATICS II

Time: Three Hours   Maximum: 50 Marks

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

(5 x 1 = 5)

1. Every square matrix satisfies its own ______________equation.
   (i) eigen   (ii) characteristic   (iii) Cauchy   (iv) Laplace
2. A solution containing as many arbitrary constants as there are independent variables is called __________ integral.
   (i) particular   (ii) single   (iii) complete   (iv) double
3. If $f(x)\sin nx$ is an even function then b_n is __________
   (i) $\frac{2}{\pi}\int_0^{\pi} f(x)\sin nx dx$ (ii) $\frac{2}{\pi}\int_0^{\pi} f(x)\cos nx dx$
   (iii) $\frac{1}{\pi}\int_0^{\pi} f(x)\sin nx dx$ (iv) $\frac{1}{\pi}\int_0^{\pi} f(x)\cos nx dx$
4. $L(e^{at}) =$
   i) $\frac{1}{s+a}$ (ii) $\frac{1}{s^2-a}$ (iii) $\frac{1}{s-a}$ (iv) $\frac{1}{s^2+a}$
5. The rate of convergence of Gauss seidel method is __________ that of Gauss-Jacobi method.

SECTION B (15 MARKS)
Answer **ALL** the questions
ALL questions carry **EQUAL** marks   (3×5=15)

6. (a) Calculate A^4 when $A = \begin{bmatrix} -1 & 3 \\ -1 & 4 \end{bmatrix}$

   (OR)

   (b) Determine the eigen values of the matrix $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$

7. a) Eliminate the arbitrary function from $z = f(x^2 + y^2)$

   (OR)

   b) Solve $p(1+q^2) = q(z-1)$
8. a) Compute the Fourier series for $f(x) = x(-\pi < x < \pi)$

   (OR)

   b) Find a sine series for $f(x) = c$.
9. a) Find $L(\sin^3 2t)$

   (OR)

   b) Find $L^{-1}\left(\frac{s-3}{s^2+4s+13}\right)$
10. a) Define Jordon's modification.

    (OR)

    b) Compare Gauss elimination and Gauss Seidal method.

Cont…

SECTION C (30 MARKS)

Answer **ALL** the questions

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

11. a) Find the characteristic equation of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence obtain its inverse.

(OR)

b) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

12. a) Solve $x\frac{\partial z}{\partial x} = 2x + y + 3z$.

(OR)

b) Find the general solution of $(y+z)p + (z+x)q = x + y$.

13. a) Show that $x^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty}(-1)^n \frac{\cos nx}{n^2}$ in the interval $-\pi \le x \le \pi$

(OR)

b) If $f(x) = \begin{cases} x \text{ when } 0 < x < \frac{\pi}{2} \\ \pi - x \text{ when } x > \frac{\pi}{2} \end{cases}$ expand $f(x)$ as a sine series in the interval $(0, \pi)$.

14. a) Prove that $L(t^n) = \frac{n!}{s^n + 1}$ where n is a positive integer.

(OR)

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

15. a) Solve by Gauss elimination method
$2x + y + 4z = 12, 8x - 3y + 2z = 20, 4x + 11y - z = 33$

(OR)

b) Solve by Gauss Seidal method
$27x + 6y - z = 85, 6x + 15y + 2z = 72, x + y + 54z = 110$

Z-Z-Z END