PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MSc DEGREE EXAMINATION MAY 2022
(Second Semester)
Branch – PHYSICS
MATHEMATICAL PHYSICS

Time: Three Hours   Maximum: 50 Marks

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

1. If f(z) is given by $f(z) = \frac{z+1}{z(z-2)}$, then the singularities of the function is
   a. z=0, 2=-2
   b. z=2
   c. z=0
   d. z=0,z=2

2. Find L(sinat). The options are
   a. $\frac{1}{s-a}$
   b. $\frac{1}{s+a}$
   c. $\frac{1}{s2-a2}$
   d. a/s^2+a^2

3. Which among the following is the value of $P_0(x)$ is
   a. x
   b. 1
   c. 0
   d. $5x-x^2$

4. For which type of a matrix does determinant exist?
   a. row matrix
   b. column matrix
   c. square matrix
   d. Null matrix

5. The formula of bisection method is
   a. c=(a+b)/2
   b. c=a/2
   c. c=(a-b)/2
   c=a.b

SECTION - B (15 Marks)
Answer ALL Questions
ALL Questions Carry EQUAL Marks   (5 x 3 = 15)

6   a   Write down the caucht Riemann equations. Using these equations determine whether f(z)=1/z is analytic or not.

OR

    b   State and explain Cauchy's integral formula.

7   a   Discuss any three properties of Fourier Transform.

OR

    b   Solve: $L(e^{at}\cos at)$.

8   a   Explain the Rodrigue's formula of Legendre polynomial and obtain $P_3(x)$.

OR

    b   Show that $H_n(-x)=(-1)^n H_n(x)$.

9   a   Find the Rank of the following matrix.

$$A=\begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & -4 \\ -5 & 3 & 3 & 11 \end{bmatrix}$$

OR

    b   State and explain Cayley Hamilton Theorem.

10 a   State the application of 4th order Range Kutta Method and write down all the formulas of 4th order RK Method.

OR

    b   Determine the root of equation $x^3-4x-9=0$ using biscection method.

SECTION -C (30 Marks)
Answer ALL questions
ALL questions carry EQUAL Marks   (5 x 6 = 30)

11 a State the theorem on "derivatives of an analytic function" and prove it.

OR

b State Taylor's series and derive its proof.

12 a Develop the Fourier sine Transform and cosine Transform of Derivative from their respective transform equations.

OR

b Find(i) $L(t^n)$,n>0, (ii) $L(e^{at})$ (iii) $L(\cosh at)$.

13 a Obtain the Generating function for $J_n(x)$.

OR

b Elucidate the importance of Laplace equation and express it in cylindrical coordinate system.

14 a Using matrices, solve the following system of linear equations:

$x-y+2z=7$

$3x+4y-5z=-5$

$2x-y+3z=12$

OR

b Determine the eigen values and eigen vectors of the matrix $A=\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 4 & 9 \end{bmatrix}$

15 a Fit a straight line y=ax+b for the following data.

X: 1 3 4 6 8 9 11 14

Y: 1 2 4 4 5 7 8 9

OR

b Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using
(i) trapezoidal rule by taking h=1/4   (ii) simpson's 1/3rd rule with h=1/4

Z-Z-Z   END