PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2019
(Second Semester)

Branch – **PHYSICS**

MATHEMATICS – II

Time: Three Hours | Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 1 = 10)

1 Characteristics equation of the matrix $A=\begin{bmatrix}5 & 3\\1 & 3\end{bmatrix}$ is

(i) $\lambda^2+8\lambda-12=0$ (ii) $\lambda^2-8\lambda-12=0$ (iii) $\lambda^2-8\lambda+12=0$ (iv) $\lambda^2+8\lambda+12=0$

2 When the matrix A is symmetric, then the eigen values of A are
(i) real (ii) complex (iii) both real and complex (iv) imaginery

3 Partial differential equation obtained from z=(x+a)(y+b) by eliminating a and b is
(i) z=pq (ii) z=(p+a)q (iii) z=(p+a)(p+b) (iv) $z=p/q$

4 Complete integral of z=px+qy+pq is
(i) z=ax+by (ii) z=ax+by+ab (iii) ax+by+pq=0 (iv) does not exists

5 Fourier constant a_o= ______ if $f(x)=x^2$, $(-\pi<x<\pi)$

(i) 0 (ii) $\pi^2/3$ (iii) $2\pi^2/3$ (iv) $\pi^2/2$

6 If f(x) is an even function then f(x)=______.
(i) f(-x) (ii) -f(-x) (iii) -f(+x) (iv) +f(+x)

7 L[f(t)]=

(i) $\int_0^{-\infty} e^{-st}f(t)dt$ (ii) $\int_{-\infty}^{\infty} e^{-st}f(t)dt$ (iii) $\int_0^{\infty} e^{st}f(t)dt$ (iv) $\int_{-\infty}^{\infty} e^{st}f(t)dt$

8 $L^{-1}\left[\frac{1}{(s-3)^2}\right]=$ ______.

(i) e^{3t} (ii) te^{3t} (iii) t^2e^{3t} (iv) t^3

9 Direct methods for solving algebraic equations are
(i) Gauss elimination and Gauss Jacobi (ii) Gauss elimination and Gauss Jordan
(iii) Gauss Jordan and Gauss Jacobi (iv) Gauss Jacobi and Gauss Seidal

10 Which of the following matrices are diagonally dominant?

(i) $\begin{bmatrix}10 & -5 & -2\\4 & -10 & 3\\1 & 6 & 10\end{bmatrix}$ (ii) $\begin{bmatrix}2 & 3 & -1\\5 & 8 & -4\\1 & 1 & 1\end{bmatrix}$

(iii) $\begin{bmatrix}1 & 6 & -2\\4 & 1 & 1\\-3 & 1 & 7\end{bmatrix}$ (iv) $\begin{bmatrix}3 & 9 & -2\\4 & 2 & 13\\4 & -2 & 1\end{bmatrix}$

SECTION - B (25 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 5 = 25)

11 a Find the characteristic equation of the matrix $\begin{bmatrix}1 & 2 & 3\\2 & -1 & 4\\3 & 1 & -4\end{bmatrix}$.

OR

b If $A=\begin{bmatrix}7 & 3\\2 & 6\end{bmatrix}$ find A^3 interms of A.

Cont...

12 a Form the partial differential equation by eliminating the arbitrary constants from $z=(x^2+a)(y^2+b)$.

OR

b Solve $p(1+q)=qz$.

13 a Obtain the Fourier series for $f(x)=\begin{cases}0, & -\pi<x\le 0\\ x & 0<x\le\pi\end{cases}$

OR

b Obtain the half-range sine series for $f(x)=e^x$ in $(0,\pi)$.

14 a Find $L[\sin^3 2t]$.

OR

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

15 a Solve the system of equations by Gauss-elimination method.
$2x+3y-z=5$; $4x+4y-3z=3$; $2x-3y+2z=2$

OR

b Solve the following system of equations by Gauss-Seidal method.
$10x-5y-2z=3$; $4x-10y+3z=-3$; $x+6y+10z=-3$

SECTION -C (40 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 8 = 40)

16 a Find the eigen value and eigen vectors of $\begin{pmatrix}2 & 2 & 0\\ 2 & 1 & 1\\ -7 & 2 & -3\end{pmatrix}$

OR

b State and prove Cayley-Hamilton theorem.

17 a Solve $\frac{\partial^2 z}{\partial x^2}=a^2 z$ given that when x=0; $\frac{\partial z}{\partial x}=a\sin y$ and $\frac{\partial z}{\partial y}=0$.

OR

b Solve $(1+y)p+(1+x)q=z$.

18 a Find the Fourier series for the function $f(x)=\frac{1}{2}(\pi-x)$ in the interval $(0,2\pi)$ and hence deduce that $1-1/3+1/5-1/7+\ldots=\pi/4$.

OR

b If $f(x)=-x$ in $-\pi<x<0$
$= x$ in $0<x<\pi$
Expand f(x) as a Fourier series in the interval $-\pi$ to π. Deduce that $\pi^2/8=1+1/3^2+1/5^2+\ldots$

19 a (i) If $L[f(t)]=F(s)$ then prove that $L[f(at)]=\frac{1}{a}F(s/a)$
(ii) Evaluate $L[t\sin at]$.

OR

b Using Laplace transform, solve $y^{11}-3y^{1}+2y=e^{-t}$ given that $y(0)=1$, $y^{1}(0)=0$.

20 a Find the inverse of the matrix $A=\begin{bmatrix}2 & 1 & 1\\ 3 & 2 & 3\\ 1 & 4 & 9\end{bmatrix}$ using Gauss elimination method.

OR

b Solve the following system of equations by using Gauss-Jacobi method.
$8x-3y+2z=20$; [illegible]