PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2022
(First Semester)

Branch – **ELECTRONICS**

MATHEMATICS - I

Time: Three Hours | Maximum: 50 Marks

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

1. If $A^T = A$, then A is _____.
   (i) transpose ii) symmetric
   iii) skew-symmetric iv) unit matrix

2. $tanix$ is _____.
   (i) $tanhx$ (ii) $\tanh(ix)$
   (iii) $itanhx$ (iv) $-tanhx$

3. $\int_0^{\pi/2} sin^3 x dx$ is _____.
   (i) $\pi/3$ (ii) $\pi/2$
   (iii) $3\pi/2$ (iv) $4\pi/3$

4. Find the value of $\int_0^1 \int_1^2 (x^2 + y^2) dxdy$.
   (i) $\frac{7}{3}$ (ii) $\frac{5}{3}$
   (iii) $\frac{3}{8}$ (iv) $\frac{8}{3}$

5. _____ method converges only for special systems of equations.
   (i) Gauss elimination (ii) Gauss-seidel
   (iii) Gauss Jacobi (iv) Gauss-seidel iterative

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

6. a. If $A = \begin{bmatrix} 1 & -1 & 2 \\ 3 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ then calculate $A + A'$ and $A - A'$.

(OR)

b. Identify eigen values and eigen vectors of the matrix $A = \begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$.

7. a. Express $cos6\theta$ in terms of $cos\theta$.

(OR)

b. Separate into real and imaginary parts of $\tan(x + iy)$;

8. a. Evaluate $\int_0^{\frac{\pi}{2}} sin^8 x cos^6 x dx$.

(OR)

b. Show that $\int_0^{\pi} cos^3 x dx = 0$.

Cont...

9. a. Evaluate $\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \sin(\theta + \emptyset)\ d\theta d\emptyset$.

(OR)

b. Change the order of integration in $\int_0^a \int_x^a (x^2 + y^2)\ dydx$ and hence evaluate it.

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

(OR)

b. Solve $x + 2y + z = 3,\ 2x + 3y + 3z = 10,\ 3x - y + 2z = 13$ by Gauss Jordan method.

SECTION -C (30 Marks)

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

11. a. Show that the matrix $\frac{1}{3}\begin{bmatrix} 2 & 2 & 1 \\ -2 & 1 & 2 \\ 1 & -2 & 2 \end{bmatrix}$ is orthogonal.

(OR)

b. Verify Cayley-Hamilton theorem for $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$. Hence find its inverse.

12. a. Prove that $cos8\theta = 1 - 32sin^2\theta + 160sin^4\theta - 256sin^6\theta + 128sin^8\theta$.

(OR)

b. If $\tan(\theta + i\emptyset) = \sin(x + iy)$, prove that $\cot h\, y sin\, h\, 2\emptyset = cotx.sin2\theta$.

13. a. Evaluate $\int cot^6 x\ dx$ using reduction formula.

(OR)

b. Evaluate $\int_0^{\pi/2} \frac{sin^2 x}{sinx+cosx} dx$.

14. a. Evaluate $\iiint (x - y + z) dxdydz$ where R is given by
$1 \le x \le 2;\ 2 \le y \le 3, 1 \le z \le 3$.

(OR)

b. Change the order of integration in $\int_0^a \int_{a-\sqrt{a^2-y^2}}^{a+\sqrt{a^2-y^2}} dx\ dy$ and hence evaluate it.

15. a. Solve the system by Gauss-Jacob method
$10x - 5y - 2z = 3$
$4x - 10y + 3z = -3$
$x + 6y + 10z = -3$, correct to three decimal places.

(OR)

b. Solve the system of equations
$8x - 3y + 2z = 20$
$4x + 11y - z = 33$
$6x + 3y + 12z = 35$ by Gauss-seidel method correct to 3 decimal places.

Z-Z-Z END