PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 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 $A = \begin{pmatrix} 2 & 3 \\ -1 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 5 & -2 \\ 1 & -3 \end{pmatrix}$ then find A+B =

   (a) $\begin{pmatrix} 7 & 1 \\ 2 & 7 \end{pmatrix}$ (b) $\begin{pmatrix} 7 & 1 \\ 0 & 1 \end{pmatrix}$ (c) $\begin{pmatrix} -3 & 5 \\ -2 & 7 \end{pmatrix}$ (d) $\begin{pmatrix} -3 & 1 \\ 0 & 1 \end{pmatrix}$

2.   If $x = \cos\theta + i\sin\theta$, what is the value of $\left(x - \dfrac{1}{x}\right)^n$?

   (a) $2i\sin\theta$ (b) $(2i)^n \sin^n\theta$ (c) $2i\cos\theta$ (d) $(2i)^n \cos^n\theta$

3.   Choose, if f(x) is an odd function of x, $\displaystyle\int_{-a}^{a} f(x)\,dx =$ _____.

   (a) 0   (b) $-\displaystyle\int_{b}^{a} f(x)\,dx$ (c) $-f(-x)$ (d) 2

4.   Find $\displaystyle\int_{0}^{1}\int_{0}^{1} xy\,dy\,dx$

   (a) $\dfrac{1}{4}$ (b) $\dfrac{1}{2}$ (c) 1   (d) 0

5.   "As soon as a new value for a variable is found by iteration it is used immediately in the following equation". This method is alled
   (a) Gauss – Seidel   (b) Jacobi's
   (c) Gauss – Jordan   (d) Gauss – elimination

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

6.   a)   If $A = \begin{bmatrix} 3 & 1 & -1 \\ 0 & 1 & 2 \end{bmatrix}$, find AA′ and A′A.

(or)

   b)   If $A = \begin{bmatrix} 1 & -1 & 2 \\ 3 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$, find A + A′

7.   a)   Express $\cos 5\theta$ iterms of $\cos\theta$.

(or)

   b)   Express $\sin 7\theta$ iterms of $\sin\theta$.

8. a) Show that $\int_0^{\pi/2} \sin^n x \, dx = \int_0^{\pi/2} \cos^n x \, dx$.

(or)

   b) Evaluate $\int_0^{\pi/2} \cos^8 x \, dx$.

9. a) Evaluate the double integral $\int_0^1 \int_0^{x^2} (x^2 + y^2) \, dy \, dx$.

(or)

   b) Evaluate $\int_0^1 dx \int_0^2 dy \int_0^3 xyz \, dz$.

10. a) Use Gauss – elimination method, solve.
       $2x + y + 4z = 12$, $\quad 8x - 3y + 2z = 20$, $\quad 4x + 11y - z = 33$.

(or)

   b) Apply Gauss – Jordan method, solve
       $x + 2y + z = 3$, $\quad 2x + 3y + 3z = 10$, $\quad 3x - y + 2z = 13$.

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

11. a) Verify Cayley – Hamilton theorem for $A = \begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}$.

(or)

   b) Find the eigenvalues and eigenvectors of the matrix $\begin{pmatrix} 3 & 4 \\ 4 & -3 \end{pmatrix}$.

12. a) Prove that $\sin^5 \theta = \frac{1}{16} [\sin 5\theta - 5 \sin 3\theta + 10 \sin \theta]$.

(or)

   b) Separate the real and imaginary parts of $\log (4 + 3i)$.

13. a) Obtain reduction formula for $\int \sin^n x \, dx$ (n being a positive integer).

(or)

   b) Evaluate $\int_0^{\pi/2} \frac{(\sin x)^{3/2}}{(\sin x)^{3/2} + (\cos x)^{3/2}} dx$.

14. a) Change the order of integration $\int_0^a \int_x^a (x^2 + y^2) \, dy \, dx$.

(or)

   b) Evaluate $\int_0^2 \int_1^3 \int_1^2 xy^2 z \, dz \, dy \, dx$.

15. a) Solve, by Gauss – Jacobi mehod.
       $27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$.

(or)

   b) Solve Gauss – seidel method
       $10x - 5y - 2z = 3$, $4x - 10y + 3z = -3$, $x + 6y + 10z = -3$.

Z-Z-Z $\qquad$ END