

REV. 01  
BSP/02/05

*Repeat*

B.SC. PHYSICS  
SECOND SEMESTER  
MATHEMATICAL PHYSICS II  
BSP – 202  
(USE OMR FOR OBJECTIVE PART)

2024/06

**SET  
A**

Duration: 1:30 hrs.

Full Marks: 35

Time: 15 mins.

( Objective )

Marks: 10

*Choose the correct answer from the following:*

**$1 \times 10 = 10$**

- The element  $a_{21}$  in the matrix  $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$  will be
  - 1
  - 1
  - 3
  - 2
- If  $A = \begin{pmatrix} 3 & -2 \\ 1 & 0 \end{pmatrix}$  then  $2a_{21} + a_{12}$  will be
  - 1
  - 2
  - 0
  - 3
- If  $A = (a_{ij})_{2 \times 2} = \begin{pmatrix} 2 & 1 \\ -1 & 5 \end{pmatrix}$  then the co-factor of  $a_{22}$  will be
  - 1
  - 1
  - 2
  - 5
- If  $A = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$  and  $B = (2 \ 1)$ , then  $BA$  will be
  - 0
  - 1
  - 1
  - 2
- If  $A = \begin{pmatrix} 1 & -1 \\ -2 & 3 \end{pmatrix}$  and  $\det(A)$  will be
  - 1
  - 2
  - 1
  - 3
- If  $A = \begin{pmatrix} 1 & -1 \\ -2 & 2 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 1 \\ 2 & 0 \end{pmatrix}$ , then  $\frac{1}{2}(A + B)$  will be a matrix of what?
  - $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
  - $\begin{pmatrix} 0 & 2 \\ 2 & 0 \end{pmatrix}$
  - $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
  - $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$

7. If  $I_{2 \times 2}$  is a Identity matrix, then its trace will be
- a. 0
  - b. 1
  - c. 2
  - d. -1
8. If  $A$  is a square matrix, then  $(A^T)^T$  will be
- a.  $A^T$
  - b.  $A^{-1}$
  - c.  $A$
  - d.  $A^\theta$
9. If  $A$  is a square matrix and  $\lambda$  is a scalar, then  $(\lambda A)^\theta$  will be
- a.  $A^\theta$
  - b.  $\lambda A^T$
  - c.  $\lambda A$
  - d.  $\lambda A^\theta$
10. If  $A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$  then its transpose  $A^T$  will be
- a.  $A$
  - b.  $-A$
  - c.  $2A$
  - d.  $A^{-1}$

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**( Descriptive )**

Time : 1 hr. 15 min.

Marks : 25

*[ Answer question no.1 & any two (2) from the rest ]*

1. For the matrix  $A = \begin{pmatrix} 2 & -1 \\ 3 & 5 \end{pmatrix}$ , find its co-factor and determinant. 5
2. a. What do you mean by a symmetric and skew-symmetric matrix? 4+6=10  
b. Show that any square matrix can be expressible in terms of its symmetric and skew-symmetric parts.
3. a. If  $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$  and  $C = \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$ , show that  $(aI + bC)^3 = a^3I + 3a^2bC$ . 5+5=10  
b. If  $A = \begin{pmatrix} 4 & 2 \\ -1 & 1 \end{pmatrix}$ , find  $(A - I)(A - 2I)$ .
4. a. If  $A = \begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix}$ , then show that  $A^n = \begin{pmatrix} 1 + 2n & -4n \\ n & 1 - 2n \end{pmatrix}$  for any positive integer  $n$ . 5+5=10  
b. If  $A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ , then find the expression  $A^2 - 2A + I$ .
5. a. What do you mean by Hermitian matrix? If  $A$  is a skew-Hermitian matrix then show that  $iA$  is Hermitian. 4+3+3=10  
b. Find transpose conjugate of the following matrices  
(i)  $\begin{pmatrix} 1 & 2 + 3i \\ 2 - 3i & -2 \end{pmatrix}$  (ii)  $\begin{pmatrix} 1 + i & -1 + 2i \\ 1 - i & 2 \end{pmatrix}$

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