

**B.SC. MATHEMATICS  
FIRST SEMESTER  
ALGEBRA  
BSM – 102 IDMn**

**SET  
A**

[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 1.30 hrs.

Full Marks: 35

( Objective )

Time: 15 min.

Marks: 10

*Choose the correct answer from the following:*

**1X10=10**

- Real and imaginary part of  $-i$  are respectively
  - 0 & 1
  - 0 & -1
  - 1 & 0
  - 1 & 0
- If  $z = \frac{1-i}{1+i}$  then the conjugate of  $z$  is
  - $\frac{1+i}{1-i}$
  - $i$
  - $-i$
  - 1
- If  $z_1 = 1 + 3i$  and  $z_2 = 5 + 2i$ , then the imaginary part of  $z_1 z_2$  is
  - 5
  - 11
  - 17
  - None of these
- The matrix  $A = \begin{bmatrix} 0 & 2 & -3 \\ 2 & 0 & -5 \\ -3 & -5 & 0 \end{bmatrix}$  is
  - Symmetric matrix
  - Anti-Symmetric matrix
  - Diagonal matrix
  - Scalar matrix
- The series  $1, 3, 9, 27, \dots$  is a/an
  - A.P. series
  - G.P. series
  - Both A.P and G.P series
  - None of these
- The determinant of a matrix  $A$  is 1, then the determinant of  $-2A$  is
  - 2
  - 8
  - 8
  - None of these

7. If  $A = \begin{bmatrix} 6 & 1 & 4 \\ -1 & 0 & 2 \\ 3 & 0 & -1 \end{bmatrix}$  then the trace of  $A$  is
- a. 0  
b. 5  
c. 7  
d. None of these
8. If  $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$  then  $\begin{vmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a & b & c \end{vmatrix}$  is
- a.  $(a-b)(b-c)(c-a)$   
b.  $(b-a)(c-b)(a-c)$   
c.  $(b-a)(b-c)(c-a)$   
d. None of these
9. The minor and co-factor of 5 of the matrix  $\begin{bmatrix} 3 & -14 & 1 \\ 5 & 4 & -10 \\ -2 & 10 & -1 \end{bmatrix}$  are respectively
- a. 4 & 4  
b. 4 & -4  
c. -4 & 4  
d. -4 & -4
10. The 12<sup>th</sup> term of the series 3, 7, 11, 15, ... is
- a. 44  
b. 47  
c. 51  
d. None of these

**( Descriptive )**

Time : 2 hrs. 30 min.

Marks : 50

*[ Answer question no.1 & any four (4) from the rest ]*

1. If  $n$  be an integer, prove that  $(1+i)^n + (1-i)^n = 2^{\frac{n}{2}+1} \cos \frac{n\pi}{4}$ . 5
2. Find the roots of the following equations (any two): 5+5=10  
(a)  $x^3 = 1$ .  
(b)  $x^4 = -i$ .  
(c)  $x^2 = 1+i$ .
3. (a) Show that the matrix  $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$  satisfies the equation  $A^3 - 4A^2 + A = 0$ . 4+3+3  
=10
- (b) Find  $x, y, z$  which satisfy the equation
- $$\begin{bmatrix} x-2 & 3 & 2z \\ 6y & x & 2y \end{bmatrix} = \begin{bmatrix} y & z & 6 \\ 18z & y+2 & 6z \end{bmatrix}$$
- (c) Find  $X = \begin{bmatrix} x & y \\ z & t \end{bmatrix}$  which satisfy the equation
- $$2X - 3 \begin{bmatrix} 1 & -2 \\ 1 & 0 \end{bmatrix} = 2 \begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix} - X$$
4. (a) If  $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & -1 & 1 \\ 2 & 0 & -3 \end{bmatrix}$ , then find  $A^{-1}$ . 5+2+3  
=10
- (b) Find the principal argument of
- (i)  $z = 1 - 2i$
- (ii)  $z = 1 + i \tan \frac{3\pi}{5}$
5. (a) How many terms of the series  $27 + 24 + 21 + 18 + \dots$  will add up to 126? 5+5=10
- (b) The sum of three consecutive numbers in a G.P. series is 26 and their product is 216. Find the numbers.

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