Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech. (Sem.–1)

BASIC MATHEMATICS-I

Subject Code : BTAM-107-18

M.Code : 75371

Date of Examination : 11-01-23

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C. have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

1. Answer briefly :

a) Find a, b if $a + ib = \frac{i}{2-i}$.

b) Solve the equation $3x^2 + 8x + 4 = 0$.

c) If the product of three consecutive numbers in GP is 27, find the first term of GP.

d) Prove $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \text{cosec } \theta + \cos \theta$.

e) Find cos 105º.

f) Check whether the matrix $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$ is singular or not.

g) If $\begin{bmatrix} a & d \\ b & c \end{bmatrix} = \begin{bmatrix} 1 & -2 \\ -1 & 1 \end{bmatrix}$, then find $a + b - c + d$.

h) Find the equation of a straight line passing through the point (3, –2) and slope –1.

i) Find the equation of a circle with center at (1, 2) and radius 4 units.

j) If the matrix A = $[a_{ij}]_{2\times 2}$, were $a_{i,j} = 2^{i+j}$, then write down the matrix A.

SECTION-B

2. a) Show that $(x+y)(y+z)(z+x) > 8xyz$.

   b) A two digit number is four times the sum and three times the product of its digits. Find the number.

3. a) If sec $A = x + \frac{1}{4x}$, prove that sec A + tan A = $2x$ or $\frac{1}{2x}$.

   b) Find x such that sec (90º + A) + x sin A. tan (90º + A) = cos (90º + A).

4. a) Prove that $\cos\theta - \sin\theta = \sqrt{2}\cos\left(\theta + \frac{\pi}{4}\right)$

   b) Evaluate ${}^{10}C_3 + {}^{10}C_4 + {}^{11}C_5$.

5. a) If $\sin\alpha = \frac{15}{17}$ and $\cos\beta = \frac{12}{13}$, then find the values of sin ($\alpha + \beta$), cos ($\alpha - \beta$) and tan ($\alpha + \beta$).

   b) If 4 numbers a, b, c, d are in AP, such that, $a + b + c + d = 32$ and $15ad = 7bc$, then find the numbers a, b, c, d.

SECTION-C

6. a) Find the value of k so that the equation $2x^2 - \frac{k}{3}y^2 + kx - 4y + 2 = 0$ represents a circle and hence find center and radius of this circle.

   b) The variance of 20 observations is 5. If each observation is multiplied by 2, find the new variance.

7. a) Find the co-ordinates of the foot of the perpendicular from the point A (–1, 3) to the line $3x - 4y = 10$ and hence, find the length of perpendicular from point A to the line.

   b) Find the mean deviation from the median of the data : 3,9,5,3,12,10,18,4,7,19,21.

8. Use Cramer's rule to solve the following system of linear equations :

$$x + y + z = 1, \quad 2x + y - z = 3, \quad x - 2y - 3z = 4.$$

9. Prove that $\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = (1 - x^3)^2$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.