

Name of Course	: CBCS B.A. (Prog.)
Unique Paper Code	: 62355604
Name of Paper	: GE-2: General Mathematics-II
Semester	: VI
Duration	: 3 hours
Maximum Marks	: 75 Marks

Attempt any four questions. All questions carry equal marks.

1. Attempt all parts.

- (i) What was the first scientific achievement of Henri Poincare?
- (ii) Discuss the life of Cantor as a teacher and researcher.
- (iii) What do you know about Ramanujan's lost notebook?
- (iv) Name any four honours/ awards received by Neumann.

2. State which of the following function(s) is/are even, odd or neither:

$$\sin(|x|), x - \cos(x), x^3 + 2x^2 + x + 1, x|x|, x^2 + \cos(x), x + \tan(x).$$

What are Fractals? Give two examples and discuss its importance in nature.

Let $f(x) = \sin(|x|)$ be a real valued function. Then

- (i) Find a set of extreme points of $f(x)$.
- (ii) Find an interval on which $f(x)$ increases.
- (iii) Find an interval on which $f(x)$ decreases.

3. If $\operatorname{cosec}(x) = \frac{-1}{5}$, then determine the values of all other basic trigonometric functions in third and fourth quadrant.

Is it true that extremum points and inflection points are same? Justify your answer.

Explain platonic solids through diagrams and illustrate how they are related with four basic elements (fire, earth, air and water)?

4. Use the Gauss Elimination method to solve each of the following systems of the linear equations. In each case, indicate whether the system is consistent or inconsistent. Give the complete solution set, and if the solution set is infinite, specify three particular solutions.

(i)

$$\begin{aligned}3x_1 - 3x_2 - 2x_3 &= 23 \\-6x_1 + 4x_2 + 3x_3 &= -38 \\-2x_1 + x_2 + x_3 &= -11\end{aligned}$$

(ii)

$$\begin{aligned}5x_1 - 5x_2 - 15x_3 - 3x_4 &= -34 \\-2x_1 + 2x_2 + 6x_3 + x_4 &= 12\end{aligned}$$

5. If $A = \begin{bmatrix} -5 & -2 & 2 \\ 3 & 1 & -1 \\ 2 & 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -2 & 4 \\ -1 & 1 & -2 \\ 5 & -4 & 8 \end{bmatrix}$, then find the rank of AB .

Without row reduction, find the inverse of the coefficient matrix and hence find the solution of the following system of equations

$$\begin{aligned}x + 4y &= -3 \\-2x + 3y &= -6\end{aligned}$$

Illustrate, using diagrams, that a connected network can be drawn without lifting the pen and without repeating the lines only if it has at most two vertices with odd valence. Draw an Euler path and count the valences of each vertices.

6. Express the vector $x = [1, 2, 3]$ as a linear combination of the vectors

$$a_1 = [6, -2, 3], a_2 = [0, -5, -1], a_3 = [-2, 1, 2], \text{ if possible.}$$

Find the reduced row echelon form of A^2 , where $A = \begin{bmatrix} -5 & 3 & 0 \\ -2 & 1 & 0 \\ -3 & 0 & 1 \end{bmatrix}$.