

**3003****B.C.A. (SEM. - I) EXAMINATION, 2025-26****NEP - 2020****COMPUTER APPLICATION****COURSE / PAPER NAME - FOUNDATION OF MATHEMATICS FOR****COMPUTER APPLICATION****PAPER-III****COURSE CODE - S020103T**

[Time : 2 Hours]

[Maximum Marks : 75]

**Instructions:** Attempt all sections as per instructions.**Section - A****Note:** Attempt all questions. Give answer of each question in 50 words.

$$10 \times 3 = 30$$

Q1.

- (a) What is Cartesian product of two sets?
- (b) What do you mean by Power set?
- (c) What do you mean by tautology?
- (d) What are Quantifiers?
- (e) Define Rank of a matrix.
- (f) What is a Scalar matrix?
- (g) What do you mean by Maxima and maximum value?

(h) Evaluate the following:

$$\lim_{x \rightarrow 0} \frac{x}{3 - \sqrt{x+9}}$$

(i) Define Gamma function.

(j) Evaluate the following integral:  $\int_2^1 \frac{2y^3 - 6y^2}{y^2} dy$

### Section - B

**Note:** Attempt any four questions. Give answer of each question in about 150 words.

4x6=24

Q2. If  $A = \{1, 2, 3, 4\}$  and  $B = \{3, 4, 5, 6\}$ , find

- a.  $A \cup B$
- b.  $A - B$
- c.  $B - A$

Q3. Determine whether the function  $f(x)$  is one-one and onto when

- a. domain =  $R$ , codomain =  $R$
- b. domain =  $R$ , codomain =  $[0, \infty)$

Q4. What do you mean by bi-conditional statements. Explain in detail with the help of truth table.

Q5. State and explain Cayley Hamilton theorem. Find inverse of the following matrix using Cayley Hamilton theorem.  $\begin{bmatrix} 1 & 0 & 2 \\ 1 & 5 & 2 \end{bmatrix}$

Q6. Solve the following system of equations using Cramer's rule-

$$x + y + z = 6$$

$$x - y + z = 2$$

$$2x + y - z = 5$$

Q7. Differentiate the following w.r.t. x:

$$y = \sin(x^3 + 2x)$$

Q8. Integrate the following:  $\int \frac{3x+5}{(x-1)(x+2)} dx$

### Section - C

**Note:** Attempt any two questions. Give answer of each question in about 450 words.

$$2 \times 10.5 = 21$$

Q9. A right circular cone has height 12 cm and base radius 6 cm. A cylinder is inscribed in the cone coaxially. Find the dimensions of cylinder of maximum possible volume.

Q10. Integrate the following  $\int_0^a \frac{x}{\sqrt{a^2 - x^2}} dx$

Q11. Integrate the following  $\int \frac{1}{1+x^4} dx$

Q12. Check for continuity of the following function at  $x = 0$

$$f(x) = \begin{cases} \frac{|x|}{x} & \text{for } x \neq 0 \\ 0 & \text{for } x = 0 \end{cases}$$

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