

Roll No. Y.C.S.I.299

97663

**BCA 1st Semester (New)
Examination – November, 2017**

MATHEMATICS

Paper : BCA-103

Time : Three Hours | Maximum Marks : 80

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question form each Unit. Question No. 1 is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) Write down all subsets of $\{a, b, c\}$.
(b) Without expanding, prove that :

$$\begin{vmatrix} 3 & 1 & 6 \\ 5 & 2 & 10 \\ 7 & 4 & 14 \end{vmatrix} = 0$$

- (c) Let $R = \{2, 3, 4\}$ and $B = \{3, 6, 8\}$. Find R where R is the relation 'x divides y' from set A to set B.
(d) Evaluate :

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$$

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P. T. O.

(ii) $y = \log \sqrt{\frac{1 - \cos x}{1 + \cos x}}$

(iii) $y = x^x$

(iv) $x = \frac{1-t^2}{1+t^2}, y = \frac{2t}{1+t^2}$

UNIT – IV

8. Evaluate :

(i) $\int \frac{1}{\sqrt{5x+3} + \sqrt{5x+2}} dx$

(ii) $\int x\sqrt{1+2x^2} dx$

(iii) $\int \frac{x}{x^4 + x^2 + 1} dx$

(iv) $\int \frac{3x+1}{(x-1)^2(x+3)} dx$

9. Evaluate :

(i) $\int (3x-2)\sqrt{x^2+x+1} dx$

(ii) $\int e^{2x} \left(\frac{2x-1}{4x^2} \right) dx$

(iii) $\int \frac{dx}{x(x^6+1)}$

(iv) $\int_0^{\pi/2} \frac{\sin^2 \theta}{(1+\cos \theta)^2} d\theta$

UNIT - II

(e) Find $\frac{dy}{dx}$, where $y = \frac{x^2 + x + 1}{\sqrt{x}}$.

(f) Find $\frac{dy}{dx}$, where $y = \sin^2 x^3$.

(g) Evaluate:

$$\int (e^{3x} - 2e^x + \frac{1}{x}) dx$$

(h) Evaluate:

$$\int \frac{dx}{1 - 9x^2}$$

UNIT - I

2. (a) Prove that:

$$(A \cap B) \cap C = A \cap (B \cap C)$$

(b) Show that:

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

3. (a) Solve:

$$\begin{aligned} x + 4y - 2z &= 3, \\ 3x + y + 5z &= 7, \\ 2x + 3y + z &= 5 \end{aligned}$$

(b) If $A = \begin{bmatrix} 1 & 3 & 5 \\ -1 & -3 & 7 \\ 0 & -5 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 4 & 6 \\ 0 & -2 & -4 \\ -6 & 8 & -8 \end{bmatrix}$,

prove that:

$$(AB)^T = B^T A^T$$

4. (a) Show that the relation "greater than" on the set of natural numbers N , is transitive but neither reflexive nor symmetric.

(b) Write the range of the following functions:

(i) $y = \sqrt{x-5}$ (ii) $y = \sqrt{4-x^2}$

5. (a) Evaluate:

(i) $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x \sin x}$ (ii) $\lim_{x \rightarrow 2} \frac{e^x - e^2}{x-2}$

(b) For what value of k is the following function continuous at $x=2$?

$$f(x) = \begin{cases} \frac{x^2 - 4}{x - 2} & \text{if } x \neq 2 \\ k & \text{if } x = 2 \end{cases}$$

UNIT - III

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

(i) $(2x+3)\sqrt{x}$ (ii) $\frac{x^2 - 1}{x^2 + 7x + 1}$

(iii) $\frac{\sin x + x^2}{\cot 2x}$ (iv) $\sin^{-1}(x^{3/2})$

7. Find $\frac{dy}{dx}$, where:

(i) $y = \sin^{-1} \sqrt{\frac{1+x^2}{2}}$