

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

$$(iii) y = x^x$$

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

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 :

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

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

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

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

Roll No. 4081299

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 from 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 :

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

(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:

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

(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:

$$x + 4y - 2z = 3,$$

$$3x + y + 5z = 7,$$

$$2x + 3y + z = 5$$

(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:

$$(AB)' = B'A'$$

### UNIT - II

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  $x=2$ ?

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

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