

7. Differentiate the following w.r.t.  $x$  :

(i)  $\frac{e^x \log x}{x^2}$

(ii)  $x^{x^2}$

(iii)  $\tan^{-1} \left( \frac{a-x}{1+ax} \right)$

(iv)  $\sqrt{\frac{(x-a)(x-b)}{(x-p)(x-q)}}$

**UNIT – IV**

8. Evaluate the following :

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

(ii)  $\int \frac{dx}{1 + 2 \cos x}$

9. Evaluate the following :

(i)  $\int_0^{\pi/2} x \sin^2 x$

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

Roll No. ....

**97663**

**BCA 1st Semestwer (New)  
Examination – November, 2019**

**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. Q. No. 1 is *compulsory*.

1. (a) Given that  $A = \{0, 1, 2, 3, 4, 5\}$ ,  $B = \{1, 3, 5\}$ . Find  $A - B$ .

(b) If  $\begin{bmatrix} x & 3x - y \\ 2x + z & 3y - w \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 7 \end{bmatrix}$ , find  $x, y, z, w$ .

(c) If  $f(x) = x^5 - \frac{1}{x^5}$ , find the value of  $f(x) + f\left(\frac{1}{x}\right)$ .

(d) Find  $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x}$ .

(e) If  $y = (1 + x)\sqrt{x}$ , find  $\frac{dy}{dx}$ .

(f) If  $y = \sin \sqrt{x}$ , find  $\frac{dy}{dx}$ .

(g) Evaluate  $\int (3x - 4)^{1/3} dx$ .

(h) Evaluate  $\int \frac{3x^2}{1 + x^3} dx$ .

### UNIT - I

2. (a) Prove that  $(A \cup B)' = A' \cap B'$ .

(b) In a group of 400 people, 250 can speak English only and 70 can speak Hindi only. Find :

(i) How many can speak both English and Hindi ?

(ii) How many can speak English ?

(iii) How many can speak Hindi ?

3. (a) Prove that :

$$\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix} = (x - y)(y - z)(z - x)(x + y + z)$$

(b) Solve  $2x + 3y + 3z = 5$ ,  $x - 2y + z = -4$ ,  $3x - y - 2z = 3$ .

### UNIT - II

4. (a) In  $N \times N$ , show that the relation defined by  $(a, b) R(c, d)$  if and only if  $ad = bc$  is an equivalence relation.

(b) If  $f, g : R \rightarrow R$  are defined respectively by  $f(x) = x^2 + 3x + 1$ ,  $g(x) = 2x - 3$ , find (i) fog (ii) gog (iii) fof (iv) gog.

5. (a) Find :

(i)  $\lim_{x \rightarrow 0} \frac{\sin x - \tan x}{(e^x - 1)}$  (ii)  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1}{x}$

(b) Show that  $f(x) = \frac{1}{x-a}$  has a discontinuity of second kind at  $x = a$ .

### UNIT - III

6. (a) Derivative of  $\sin x$  from first principle.

(b) Differentiate the following w.r.t.  $x$  :

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