

9. Evaluate the following integral :

(i) $\int \frac{1}{x \log x} dx$

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

(iii) $\int \frac{dx}{2+3\cos x}$

Roll No.

97663

**BCA 1st Semester (New)
Examination – November, 2018**

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* question in all, selecting *one* question from each Section. Q. No. 1 is *compulsory*.

1. (a) Given $A = \{a, e, i, o, u\}$, $B = \{r, a, m\}$, find $A \cap B$, $A - B$.
- (b) If $A = \begin{bmatrix} 2 & -1 \\ 4 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$, find $A + B$.
- (c) Define many – one function.
- (d) Evaluate $\lim_{x \rightarrow 1/2} \frac{4x^2 - 1}{2x - 1}$.
- (e) If $y = \cot 3x$, find $\frac{dy}{dx}$.
- (f) If $y = \cot^{-1} x^3$, find $\frac{dy}{dx}$.

(g) Evaluate :

$$\int \frac{x}{x-3} dx$$

(h) Evaluate :

$$\int \frac{1}{\sqrt{2+x}} dx$$

SECTION - I

2. (a) To prove that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
(b) In a class of 25 students, 12 students have taken Economics; 8 have taken Economics but not maths Find (i) the numbers of students who taken Economics and Maths (ii) those who have taken Maths but not Economics.

3. (a) Prove that
$$\begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix} = x^2(x+a+b+c)$$

(b) Solve :

$$x - y - z = 1, 2x + y + z = 2, x - 2y + z = 4$$

SECTION - II

4. (a) Let θ be the set of all rational numbers. Show that the function $f : \theta \rightarrow \theta : f(x) = 3x + 5 \forall x \in \theta$ is bijective. Also find f^{-1} .
(b) If R is a relation in $N \times N$, defined by $(a, b) R(c, d)$ if and only if $a + d = b + c$, show that R is an equivalence relation.

5. (a) Find $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{\sin^3 x}$.

(b) Find $\lim_{x \rightarrow 3} \frac{3-x}{\sqrt{4+x} - \sqrt{1+2x}}$.

SECTION - III

6. (a) Find the Differential coefficient of $\tan x$ by first principle.
(b) Differentiate w.r.t. x

(i) $\frac{x}{\sin 3x}$

(ii) $\frac{x^2+1}{x+1}$

7. Differentiate w.r.t. x

(i) $\sqrt{\frac{1-\sin x}{1+\sin x}}$

(ii) $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$

(iii) $x^{\log x}$

(iv) $\frac{x\sqrt{x^2+1}}{(x+1)^{2/3}}$

SECTION - IV

8. Evaluate the following integrals :

(i) $\int e^x \cos x dx$

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

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