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 $\lim_{x \to 1/2} \frac{4x^2 - 1}{2x - 1}$.

(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 $f : \theta \to \theta : f(x) = 3x + 5\ \forall\ x \in \theta$ is bijective. Also find f^{-1}.

(b) If R is a relation in N × 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 $\lim_{x \to 0} \frac{\tan x - \sin x}{\sin^3 x}$.

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

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