

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

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

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

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 :

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

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

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

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

Roll No. 4.081299

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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 $x = 2$?

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

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

9. Evaluate the following integral :

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

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

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

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