Roll No. .....

97663

B.C.A. 1st Semester (New) Examination-November, 2014

MATHEMATICS

Paper : BCA-106

Time : 3 hours **Max. 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 the examination.

Note : Attempt **five** questions in all, selecting **one** question from each unit. Question No. 1 is **compulsory**. All questions carry equal marks.

1. (a) If A = {0, 1, 2}, Write all the subset of A. $2 \times 8 = 16$

(b) Construct a 2×2 matrix $A = [a_{ij}]$ whose element is given by,

$$a_{ij} = \frac{(i-j)^2}{2}$$

(c) Evaluate the determinant :

$$\begin{vmatrix} \sin 10^\circ & -\cos 10^\circ \\ \sin 80^\circ & \cos 80^\circ \end{vmatrix}$$

(d) Let A = {1, 2, 3,..... 45} are R be the relation "is square of" on A, write R as a subset of A × A. Also find the domain and range of R.

(e) Evaluate $\lim_{x \to 2} \frac{x^{10} - 1024}{x - 2}$

(f) If $y = \sin[\cos(x^3)$, find $\frac{dy}{dx}$

(g) Differentiate $\sqrt{\tan^{-1}\sqrt{x}}$ with respect to x

(h) Evaluate $\int \frac{x^2 - 1}{x^2 + 4} dx$

UNIT – I

2. (a) In a class of 60 boys there are 45 boys who play cards and 30 boys who play carrom. Also each boy likes to play

atleast one game. Use the set operations to find :

(i) How many boys play both the games ?

(ii) How many boys play cards only ?

(iii) How many boys play carrom only ? 8

(b) If $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$, find f(A) where

$f(x) = x^3 + 3x^2 - 4x$

8

3. (a) Solve the equation : 8

$$\begin{bmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{bmatrix} = 0$$

(b) Find the inverse of the matrix :

$$\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$$ and verify the result. 8

UNIT – II

4. (a) Define properties of the relation. Show that the relation R on the set $N \times N$ defined by (a, b) R (c, d) iff $a + b = c + d$ is an equivalence relation. 8

(b) Show that the function $f : R \to R$ defined by $f(x) = \frac{2x - 1}{3}$, $x \in R$ is one-one and onto function. Also, find the inverse of the function f. 8

5. (a) Find K so that

$$f(x) = \begin{cases} 2x + 1, & x < 2 \\ k, & x = 2 \\ 3x - 1, & x > 2 \end{cases}$$

is continuous at $x = 2$ 8

(b) Evaluate the following limits : $4 \times 2 = 8$

(i) $\lim\limits_{x \to 0} \frac{1 - \cos 2x}{3 \tan^2 x}$

(ii) $\lim\limits_{x \to 2} \frac{|x - 2|}{x - 2}$

6. (a) If $y = x - \sqrt{1+x^2}$, prove that

$$\left(1+x^2\right)\left(\frac{dy}{dx}\right)^2 = y^2$$ 8

(b) Find dy/dx, where $y = \tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$. 8

7. (a) If :

$$y = \sqrt{x+\sqrt{x+\sqrt{x+\ldots\ldots\infty}}},$$

show that

$$(2y-1)\frac{dy}{dx} = 1$$ 8

(b) Differentiate the following functions w.r.t. x $4 \times 2 = 8$

(i) $y = (\sin^{-1}x)^x$

(ii) $x^3 + y^3 = \sin(x+y)$

UNIT – IV

8. (a) Integrate the following : $4 \times 2 = 8$

(i) $\int \frac{\cos x - \sin x}{1 + \sin 2x} dx$

(ii) $\int \frac{2x}{x^4 + x^2 + 1} dx$

(b) Evaluate : $\int \frac{dx}{x^3 + x^2 + x + 1}$ 8

9. (a) Integrate the following : $4 \times 2 = 8$

(i) $\int \sin^{-1} x dx$

(ii) $\int_0^{\pi/2} \sqrt{\cos \theta} \sin^3 \theta \, d\theta$

(b) Integrate the following : $4 \times 2 = 8$

(i) $\int_0^{\pi/2} \frac{dx}{1 + \sqrt{\tan x}}$

(ii) $\int_0^{2\pi} |\sin x| \, dx$
