

**CS/BBA(H)/BIRM/BSCM/Even/2nd Sem/BBA-
202/2014**

2014

Mathematics II

Time Alloted : 3 Hours

Full Marks : 70

**The figure in the margin indicate full marks.
Candidates are required to give their answers in their
own words as far as practicable**

**GROUP - A
(Multiple Choice Type Questions)**

1. Choose the correct alternatives for any ten of the following:

10x1=10

i) If the order of the matrices A, B and AB are 2 x 3, m x n and 2x2 respectively, then the value of m and n are

- a) 2, 2
- b) 3, 2
- c) 2, 3
- d) 3, 3

ii) The matrix $\begin{pmatrix} 1 & t \\ 5 & 10 \end{pmatrix}$ is non-singular, if t is not equal to

- a) 1
- b) 2
- c) 3
- d) 4

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[Turn over]

iii) The value of $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)$ is

- a) 1
- b) $1/e$
- c) 0
- d) e

iv) A matrix A is said to be an idempotent matrix if

- a) $A^2 = 0$
- b) $A^2 = A$
- c) $A^2 = I$
- d) none of these

v) If $f(x, y) = x \cos y + ye^x$, then $\left(\frac{\partial f}{\partial x}\right)_{(0, \frac{\pi}{2})}$ is

- a) 0
- b) π
- c) $-\pi$
- d) $\pi/2$

vi) The eccentricity of the rectangular hyperbola is:

- a) $\frac{1}{\sqrt{2}}$
- b) $\sqrt{2}$
- c) 2
- d) none of these

vii) $\int_0^4 \tan^2 x dx =$

- a) $1 - \frac{\pi}{4}$

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b) $1 + \frac{\pi}{4}$

c) $-\frac{\pi}{4}$

d) $\frac{\pi}{4}$

viii) Rank of the matrix $\begin{pmatrix} 1 & 1 & 1 \\ 1 & -1 & -1 \\ 3 & 1 & 1 \end{pmatrix}$ is

- a) 0
- b) 1
- c) 2
- d) 3

ix) The greatest value $f(x) = \sin x + \cos x$ is

a) $\sqrt{2}$

b) $2\sqrt{2}$

c) $\frac{1}{\sqrt{2}}$

d) none of these

x) The value of a skew-symmetric determinant of odd order is

- a) 3
- b) 1
- c) 2
- d) 0.

xi) The length of latus rectum of the hyperbola $9x^2 - 25y^2 = 225$ is

a) $\frac{9}{5}$

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b) $\frac{18}{5}$

c) $\frac{10}{9}$

d) $\frac{5}{9}$

xii) Which of the following functions continuous for all real values of x

a) $\frac{1}{x}$

b) $|x|$

c) $\frac{x}{|x|}$

d) $\frac{x}{x-1}$

xiii) If $A = \begin{pmatrix} 1 & 2 \\ -2 & 3 \end{pmatrix}$, then $(2A + A')$ is

a) $\begin{pmatrix} 3 & 2 \\ -2 & 9 \end{pmatrix}$

b) $\begin{pmatrix} 2 & 3 \\ -2 & 9 \end{pmatrix}$

c) $\begin{pmatrix} 2 & 9 \\ -2 & 3 \end{pmatrix}$

d) none of these

xiv) The focus of $y^2 = 36x$ is

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- a) (3,0)
- b) (9,0)
- c) (3,9)
- d) None of these.

xv) The function $u(x, y) = \frac{(x+y)^2}{(x-y)^2}$ is a homogeneous function of degree.

- a) 1
- b) 0
- c) 2
- d) -1

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. 3x5=15

2. Solve the following system of equation by Cramer's Rule

$$x + 2y + 3z = 6, 2x + 4y + z = 7, 3x + 2y + 9z = 14$$

3. Prove that $\begin{vmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = (b-c)(c-a)(a-b)(ab+bc+ca)$

4. Find the maximum value of $x^{1/z}$

5. Find the Adjugate matrix of the square matrix $\begin{pmatrix} 2 & -3 & 4 \\ 1 & 0 & 1 \\ 0 & -1 & 4 \end{pmatrix}$

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6. Evaluate $\int \frac{dx}{(1-x)\sqrt{1-x^2}}$
7. Find the equation of an ellipse for which the principal axes are along the coordinate axis, the length of latus rectum is 4 unit and eccentricity is $\frac{1}{3}$

GROUP - C

(Long Answer Type Questions)

Answer any three of the following. 3x15=45

8. a) Solve the following system of equations by Matrix Inversion Method :
- $3x+y+z=4$
 $x-y+2z=6$
 $x+2y-z=3$
- b) find The latus rectum and the co-ordinates of the foci of the equilateral hyperbola $x^2 - y^2 = 25$
- c) Express the matrix $\begin{pmatrix} 1 & 1 & 1 \\ 2 & -1 & 3 \\ 1 & 3 & -2 \end{pmatrix}$ as a sum of a symmetric and skew-symmetric matrices.
9. i) Find the equation of the parabola whos focus is at the point (3,-2) and directrix is the line $2x-y+3=0$.
- (ii) Find the points of local maxima and minima and the corresponding maximum and minimum values of the function
- $f(x) = x + \frac{1}{x}$

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(iii) A function is defined as $f(x) = |x|$, for all $x \in \mathbb{R}$. Show from definition that $f'(0)$ does not exist.

5+5+5

10. a) For the matrix $A = \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$, Show that $A^2 - 5A + 7I_2 = 0$

b) If $v = \sin^{-1} \left(\frac{x^2 + y^2}{x + y} \right)$, then show that $x \frac{\partial v}{\partial x} + y \frac{\partial v}{\partial y} = \tan v$

c) If $y = x^x$, then find $\frac{dy}{dx}$

11. a) If $y = \sin(a + bx)$, then find yn .

b) Evaluate $\lim_{n \rightarrow \infty} \left\{ \frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{2n} \right\}$

c) Evaluate $\int_{-1}^1 x|x| dx$

12. a) If $y = \sin(m \sin^{-1} x)$, then prove that $(1-x^2)y^2 - xy_1 + m^2y = 0$

b) If $u = x\phi \frac{y}{x} + \psi \left(\frac{y}{x} \right)$ then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = x\phi \left(\frac{y}{x} \right)$

c) Evaluate $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}}$.