Name :	Oligan
Roll No. :	Constant (V Exception and Exception
Invigilator's Signature :	

# CS/BBA(H)BIRM/BSCM/SEM-2/BBA-202/2013 2013 MATHEMATICS-II

Time Allotted : 3 Hours

Full Marks : 70

The figures 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 Questions)

- 1. Choose the correct alternatives for any ten of the following :  $10 \times 1 = 10$ 
  - i) The value of the

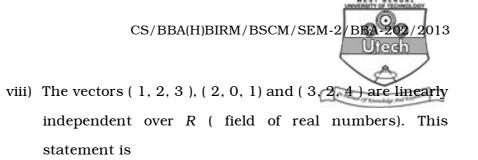
lim x → 0	$(1+x)^{\frac{1}{x}}$	is equal to	

- a) 1 b) *e*
- c) 0 d)  $\infty$ .
- ii) The curve y = |x| is symmetric about
  - a) x axis b) y axis
  - c) y = x d) none of these.

2052

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iii) if 
$$\begin{pmatrix} 7 & x+y \\ 8 & x-y \end{pmatrix} = \begin{pmatrix} 7 & 5 \\ 8 & 3 \end{pmatrix}$$
, then the values of x are y are  
a)  $x = 4, y = 1$  b)  $x = 3, y = 2$   
c)  $x = 1, y = 4$  d)  $x = 0, y = 5$ .  
iv) A function  $f(x)$  is said to be odd if  $f(-x)$  is equal to  
a)  $f(x)$  b)  $-f(x)$   
c)  $-f(-x)$  d) none of these .  
v) The rank of the matrix  
 $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{pmatrix}$  is  
a) 1 b) 2  
c) 3 d) None of these.  
vi) The parametric coordinates of the parabola  
 $y^2 = 4ax$  are  
a)  $(at^2, 2at)$  b)  $(-at^2, -2at)$   
c)  $(-at^2, 2at)$  d) none of these.  
vii) The function  $f(x, y) = \frac{x^3 + y^3}{x^2 + y^2}$  is homogeneous of  
degree  
a) 1 b) 2  
c) 3 d) none of these.



- a) true b) false.
- ix) If M is a square matrix of order 3 , then its transpose is a matrix of order
  - a)  $2 \times 3$  b)  $2 \times 2$
  - c)  $3 \times 3$  d)  $3 \times 2$ .

x) The value of  $\frac{d}{dx}(a^x)$  is equal to

- a)  $a^x$  b)  $a^x \log_e a$
- c)  $\log_e a$  d)  $x a^{x-1}$ .

xi) The value of 
$$\int \frac{\mathrm{d}x}{a^2 - x^2}$$
 is

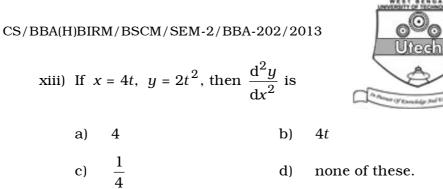
a)  $\frac{1}{2a} \log \left| \frac{x-a}{x+a} \right|$  b)  $\frac{1}{2a} \log \left| \frac{x+a}{x-a} \right|$ c)  $\frac{1}{2a} \log \left| \frac{a+x}{a-x} \right|$  d) none of these.

xii) If *A* is an orthogonal matrix, then det A = |A| is

- a) 1 only b) 1 only
- c)  $\pm 1$  d) 0.

2052

[ Turn over



xiv) If e is the eccentricity of a hyperbola, then

	a)	<i>e</i> = 0	b)	<i>e</i> = 1
	c)	<i>e</i> > 1	d)	<i>e</i> < 1.
xv)	If A	$= \begin{pmatrix} 2 & 0 \\ 0 & 0 \end{pmatrix} \text{ and } B = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$	0 3	, then AB is equal to
	a)	$\left(\begin{array}{cc} \mathbf{O} & \mathbf{O} \\ \mathbf{O} & \mathbf{O} \end{array}\right)$	b)	$\left(\begin{array}{cc} 2 & 0 \\ 0 & 3 \end{array}\right)$
	c)	$\left(\begin{array}{cc} 6 & 0 \\ 0 & 0 \end{array}\right)$	d)	$\left(\begin{array}{cc} 0 & 0 \\ 0 & 6 \end{array}\right).$

**GROUP – B** 

#### (Short Answer Type Questions)

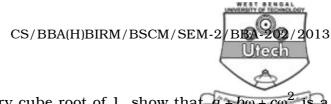
Answer any *three* of the following.  $3 \times 5 = 15$ 

2. Cramer's rule the following simultaneous Solve by equations :

$$x + y = 0$$
$$y + z = 1$$
$$z + x = -1$$

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2052



3. If  $\omega$  is imaginary cube root of 1, show that  $a + b\omega + c\omega^2$  is a factor of

$$\Delta = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}.$$

4. Find the points on the curve  $y = x + \frac{1}{x}$  at which the tangents to the curve are parallel to *x* -axis.

5. Evaluate 
$$\int_{0}^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} \, \mathrm{d}x.$$

6. Evaluate 
$$\frac{\lim}{x \to 1} (1-x) \tan \frac{x\pi}{2}$$

7. Evaluate  $\int_0^1 e^x dx$  as the limit of a sum.

#### **GROUP – C**

#### (Long Answer Type Questions)

- Answer any *three* of the following.  $3 \times 15 = 45$
- 8. a) Find the coordinates of the foci of the ellipse

$$3x^2 + 4y^2 = 12$$

b) Without expanding show that

$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (b-c)(c-a)(a-b).$$

2052

[ Turn over

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c) If  $y = (\cos^{-1} x)^2$ , show that

$$(1-x^2) \frac{d^2y}{dx^2} - x\frac{dy}{dx} = 2$$



- 9. a) Find the equation of the parabola where vertex is at the origin, the axis on the *y*-axis and which passes through the point (6, -3).
  - b) If  $f(x) = (x 1)e^{x} + 1$ , show that f(x) is an increasing function of x for all positive values of x.
  - c) Find the area bounded by the ellipse

 $4x^2 + 9y^2 = 36$  and the *x* -axis.

10. a) Examine whether the following matrix

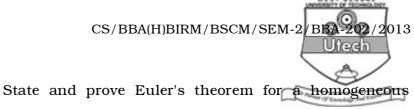
$$A = \frac{1}{3} \left( \begin{array}{rrrr} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{array} \right)$$

is orthogonal.

- b) Show that all rectangles of a given perimeter, the square has the maximum area.
- c) Differentiate

$$\sin^{-1}\frac{2x}{1+x^2}$$
 with respect to  $\tan^{-1}\frac{2x}{1-x^2}$ .

2052



- function of two variables.
  - b) Integrate  $\cos^2 x$  with respect to *x*.
  - c) Evaluate :

11. a)

$$\lim_{x \to \infty} \left( \frac{1^2 + 2^2 + 3^2 + \dots + n^2}{n^3} \right).$$

- 12. a) Find the equation of the ellipse whose latus rectum is 5 and whose eccentricity is  $\frac{2}{3}$ , the axes of the ellipse being the coordinate axes.
  - b) Examine the continuity of the following function f (x) at
     x = 0, where f (x) is defined by

$$f(x) = \frac{\sin 3x}{2x}, \text{ for } x \neq 0$$
$$= \frac{2}{3}, \text{ for } x = 0$$

c) If a function f(x) is defined by

$$f(x) = \frac{1-x}{1+x}$$
, find  $f\left(f\left(\begin{array}{c}1\\x\end{array}\right)\right)$ , for  $x \neq 0$ .

7