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CS/BBA(H)/BIRM/BSCM/SEM-2/BBA-202/2012 2012

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 Type Questions)

Choose the correct alternatives for any ten of the following:

$$10 \times 1 = 10$$

The value of t, for which the matrix $\begin{bmatrix} 1 & 2 \\ t & 3 \end{bmatrix}$ is singular, i)

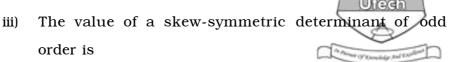
is

b) $\frac{2}{3}$

c) 1

- d) none of these.
- If $\begin{pmatrix} 2 & 3 \\ 3 & 1 \end{pmatrix} = \begin{pmatrix} 2 & x+y \\ 3 & x-y \end{pmatrix}$, then the value of x and y ii) are
 - a) x = 1, y = 2 b) x = 2, y = 1
 - c) x = 1, y = -1 d) x = 5, y = 2.

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a) 3

b) 1

c) 2

d) 0.

iv) The directrix of the parabola (y-3) $^2=8\ a\ (x-5)$ is

- a) x + a = 5
- b) x 5 = a
- c) x + 2a = 5
- d) x 5 = 2a.

v) The eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ is

a) $-\frac{4}{5}$

b) $\frac{16}{25}$

c) $\frac{5}{4}$

d) $\frac{4}{5}$.

vi) The value of $\lim_{x \to 0} \frac{\sin 4x}{5x}$ is equal to

a) $\frac{5}{4}$

b) $\frac{4}{5}$

c) $\frac{1}{5}$

d) $\frac{1}{4}$.

vii) If $y = \log x^5$, then the value of $\frac{d^2y}{dx^2}$ at $x = \frac{1}{2}$ is

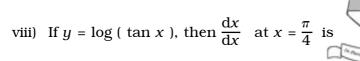
a) - 20

b) $-\frac{5}{4}$

c) 20

d) $\frac{5}{4}$.







c) 1

ix) The value of $\int \frac{5}{x^6} dx$ is

a)
$$\frac{35}{x^7}$$

b)
$$\frac{5}{x^{5}}$$

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

d) none of these.

x) The value of $\int_{0}^{1} 2x^3 dx$ is

a) 0

b)

c) $\frac{1}{4}$

d) $\frac{1}{2}$.

xi) The function $\frac{x^2 + xy}{y^2 + 4xy}$ is a homogeneous function of degree

a) 0

b) 1

c) 2

d) none of these.

xii) The gradient of the curve $y = \frac{1}{5} x^5 - \frac{2}{3} x^3 + x^2 + 2$

at

x = 1 is

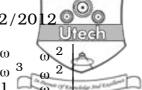
a) 0

b) 1

c) 2

d) 4.

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xiii) The value of the determinant $\begin{vmatrix} 1 & \omega \\ \omega & \omega^3 \\ \omega^2 & 1 \end{vmatrix}$

(ω being a cube roof of unity) is

a) ω^2

b) 1

c) 0

d) none of these.

xiv) If f(x) is an odd function, then f(-x) is equal to

a) f(x)

- b) -f(x)
- c) -f(-x)
- d) none of these.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following.

 $3 \times 5 = 15$

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

$$3x + y + z = 4$$

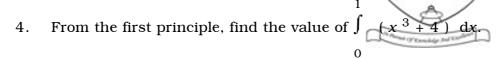
$$x - y + 2z = 6$$

$$x + 2y - z = -3.$$

3. Find the focus, vertex and directrix of the parabola $y^2 = 4y - 4x$. 2 + 1 + 2

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5. Show that
$$\begin{vmatrix} y+z & x & y \\ z+x & z & x \\ x+y & y & z \end{vmatrix} = (x+y+z)(x-z)^2.$$

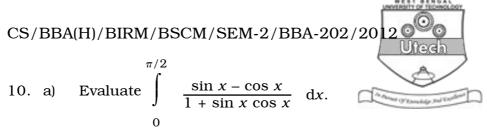
- 6. Verify Euler's theorem for $u(x, y) = \frac{x^3 + y^3}{x^2 + y^2}$.
- 7. Find the equation of the normal to the curve $y = 2x^3 3x + 5$ at the point (1, 4).

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

- 8. a) Find the inverse of the matrix $\begin{pmatrix} 1 & 1 & 1 \\ 2 & -1 & 3 \\ 1 & 3 & -2 \end{pmatrix}$.
 - b) Find the equation of the hyperbola whose vertices are(2, 3), (8, 3) and the distance between foci is 12.
 - c) Prove that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ca & ab \end{vmatrix} = (a-b)(b-c)(c-a).$
- 9. a) Find $\frac{dy}{dx}$ when $x = \frac{3 at}{1 + t^3}$, $y = \frac{3 at^2}{1 + t^3}$.
 - b) Evaluate: $\int \frac{xe^x}{(1+x)^2} dx.$
 - c) If $x = \sin t$, $y = \cos pt$, prove that $(1 - x^2) y^2 - xy_1 + p^2 y = 0$.



- b) Find the equations of the tangent and normal to the curve $y = x^2 - 4x - 2$ at the point (5, 3).
- Find the area of the region bounded by $y=x^2$, y-axis c) and the straight line y = 4.

11. a) If
$$x^y = e^{x-y}$$
, show that $\frac{dy}{dx} = \frac{\log_e x}{(1 + \log_e x)^2}$.

Determine the matrices A and B when

$$2A + B = \begin{pmatrix} 1 & 2 & 0 \\ 6 & -3 & 3 \\ -5 & 3 & 1 \end{pmatrix} a & d & 2A - B = \begin{pmatrix} 2 & 1 & 5 \\ 2 & -1 & 6 \\ 0 & 1 & 2 \end{pmatrix}$$

- c) If $v = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, then show that $x \frac{\partial v}{\partial x} + y \frac{\partial v}{\partial y} = \tan v.$
- Find the maximum value of $\left(\frac{1}{x}\right)^x$.
 - b) Verify that the function f(x) as defined below is continuous or not at x = 1:

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

c) If $A = \begin{pmatrix} 1 & 2 & 1 \\ 1 & -4 & 1 \\ 3 & 0 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 1 & 1 \\ 1 & -1 & 0 \\ 2 & 1 & 1 \end{pmatrix}$, then find AB.





- 13. a) Find y_n , if $y = (2 3x)^n$.
 - b) Find the value of $\lim_{x \to 0} \frac{7^x 5^x}{5^x 3^x}$.
 - c) Express the matrix A as a sum of a symmetric and a skew-symmetric matrix, where

$$A = \begin{pmatrix} -3 & 4 & 1 \\ 2 & 3 & 0 \\ 1 & 4 & 5 \end{pmatrix} .$$