

CS/BBA(H)/BIRM/BSCM/EVEN/SEM-2/BBA-202/2015-16



**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

**Paper Code : BBA-202
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)

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

10 × 1 = 10

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

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

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ii) The matrix A is said to be orthogonal matrix, if

- a) $\det(A) = 0$
- b) $\det(A) \neq 0$
- c) $A^T A = I$
- d) none of these.

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

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

iv) The value of $\int xe^x dx$ is

- a) xe^x
- b) $e^x(x-1)$
- c) $xe^x + x$
- d) none of these.

v) The eccentricity of the ellipse $3x^2 + 4y^2 = 24$ is

- a) $\frac{1}{4}$
- b) $\frac{3}{4}$
- c) $\frac{1}{2}$
- d) $\frac{\sqrt{3}}{2}$

vi) A matrix A is said to be an idempotent matrix, if

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

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vii) A function $f(x)$ is said to be an odd function of x if

$f(-x)$ is equal to

- a) $-f(x)$
- b) $f(x)$
- c) $f(-x)$
- d) 1.

viii) The value of $\int \frac{dx}{x^2 - a^2}$ is

- a) $\frac{1}{2a} \log \frac{a+x}{a-x}$
- b) $\sin^{-1} \frac{x}{a}$
- c) $\log \sqrt{x+x^2+a^2}$
- d) $\frac{1}{2a} \log \frac{x-a}{x+a}$

ix) The cofactor or 'c' in the determinant $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}$ is

- a) $(-1)^{3+3} \begin{vmatrix} a & h \\ h & b \end{vmatrix}$
- b) $(-1)^{3+2} \begin{vmatrix} a & h \\ h & b \end{vmatrix}$
- c) $(-1)^{2+3} \begin{vmatrix} a & h \\ h & b \end{vmatrix}$
- d) none of these.

x) The function $U(x,y) = \frac{(x+y)^2}{(x-y)^2}$ is a homogeneous

function of degree

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

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xi) Rank of the matrix $\begin{bmatrix} -1 & 3 & 1 \\ 3 & -9 & -3 \end{bmatrix}$ is

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

xii) The curve $y = |x|$ is

- a) differentiable everywhere
- b) continuous everywhere
- c) discontinuous at $x = 0$
- d) not derivable at $x = 1$.

GROUP - B

(Short Answer Type Questions)

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

2. If $f(x) = \sin(\log x)$, then find $f'(x)$.

3. Prove that $\begin{vmatrix} b+c & a-c & a-b \\ b-c & c+a & b-a \\ c-b & c-a & a+b \end{vmatrix} = 8abc$.

4. Evaluate the integral $\int \frac{x-22}{3x^2-2x-8} dx$.

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5. For the matrix $A = \begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$, show that $A^2 - 5A + 7I_2 = 0$ and hence find A^{-1} .
6. Find the equation of the parabola whose focus is (2, 1) and directrix is $3x - y + 1 = 0$.
7. Evaluate $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$.

GROUP - C

(Long Answer Type Questions)

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

8. a) Obtain the inverse of the matrix $\begin{bmatrix} 2 & 4 & -1 \\ 3 & 1 & 2 \\ 1 & 3 & -3 \end{bmatrix}$ and hence solve the following system of equations :
- $$2x + 4y - z = 9$$
- $$3x + y + 2z = 7$$
- $$x + 3y - 3z = 4$$
- b) Show that the vectors $\alpha_1 = (5, 7, 11)$, $\alpha_2 = (2, 1, 3)$ and $\alpha_3 = (3, 6, 8)$ are linearly dependent.
- c) If $x = a \cos 2t$, $y = a \sin 2t$, then find $\frac{d^2y}{dx^2}$. $7 + 3 + 5$
9. a) If $y = 3^{4x} + \frac{3}{\sqrt[3]{x}}$, find $\frac{dy}{dx}$.

b) If $y = e^x \log x$, prove that $xy_2 - (2x - 1)y_1 + (x - 1)y = 0$

c) Verify Euler's theorem for the function

$$f(x, y) = x^3 + y^3 + 3xy^2 + 3x^2y. \quad 5 + 5 + 5$$

10. a) Evaluate $\int \frac{8^{2+x} - 4^{2-x}}{2^{x+3}} dx$.

b) Evaluate $\int e^{x^3} \cdot x^5 dx$.

c) If the centre, vertex and eccentricity of a hyperbola be $(2, 4)$, $(6, 4)$ and $\sqrt{5}$, then find its equation.

5 + 5 + 5

11. a) Evaluate the determinant $\begin{vmatrix} 1 & \omega^3 & \omega^2 \\ \omega^3 & 1 & \omega \\ \omega^2 & \omega & 1 \end{vmatrix}$ where ω

is the cube root of unity.

b) Reduce the matrix $\begin{bmatrix} 0 & 0 & 5 & -3 \\ 2 & 4 & 3 & 5 \\ -1 & -2 & 6 & -7 \end{bmatrix}$ to the

matrix $\begin{bmatrix} 2 & 4 & 3 & 5 \\ 0 & 0 & 5 & -3 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ by elementary row

operations.

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- c) Taking y -axis as major axis and x -axis as minor axis, find the equation of the ellipse whose sum of the squares of the lengths of the major and minor axes is 20 and eccentricity is $\frac{1}{\sqrt{3}}$. 5 + 5 + 5

12. a) Evaluate $\int_0^1 x^3 \sqrt{1+3x^4} dx$.

- b) Find the area of the region bounded by $y = 4x^2$, $y = 0$, $x = 1$ and $x = 3$.

- c) Find the point on the parabola $y = x^2$ at which the tangent is parallel to the line $y = 4x - 5$. 5 + 5 + 5