

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/BBA (H), BIRM, BSCM/SEM-2/BBA-202/2010**

**2010**

**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 )**

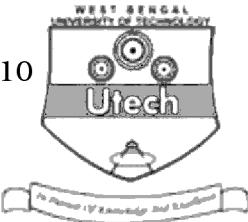
1. Choose the correct alternatives for any ten of the following :  $10 \times 1 = 10$

i) If  $f(x) = 2x^3 - 3x^2 + 4x - 2$ , then the value of  $f'(-2)$  is

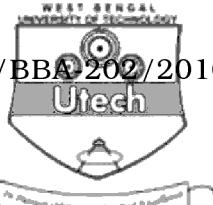
- |                  |                    |
|------------------|--------------------|
| a) $\frac{1}{4}$ | b) $-\frac{1}{4}$  |
| c) 0             | d) $\frac{1}{3}$ . |

ii) Rank of the matrix  $\begin{bmatrix} 2 & 2 \\ 1 & 1 \end{bmatrix}$  is

- |      |       |
|------|-------|
| a) 1 | b) 0  |
| c) 2 | d) 4. |



- iii) The value of  $\lim_{x \rightarrow a} \frac{x^{\frac{3}{2}} - a^{\frac{3}{2}}}{x - a}$  is
- a)  $a$       b)  $e$   
 c)  $0$       d)  $\frac{3}{2}a^{\frac{1}{2}}$ .
- iv) The eccentricity of the ellipse  $\frac{(x-2)^2}{25} + \frac{(y+3)^2}{16} = 1$  is
- a)  $\frac{3}{5}$       b)  $-\frac{3}{5}$   
 c)  $\frac{4}{5}$       d)  $-\frac{4}{5}$ .
- v) The integration of  $\int 2^x dx$  is
- a)  $\frac{2^x}{\log_e 2}$       b)  $x \cdot 2^{x-1}$   
 c)  $2^x \log_e 2$       d)  $\log_e x$ .
- vi) If  $A$  is a skew-symmetric matrix, then
- a)  $A^T = -A$       b)  $AA^{-1} = I$   
 c)  $A^T = A^{-1}$       d)  $A^T = A$ .
- vii) The determinant value of an orthogonal matrix is
- a)  $0$       b)  $1$   
 c)  $\pm 1$       d) none of these.



viii) If  $A$  be a square matrix then  $A + A^T$  is

- a) symmetric
- b) skew-symmetric
- c) transpose
- d) none of these.

ix) The order of minor of any element of a determinant of order 3 is

- a) 1
- b) 2
- c) 3
- d) none of these.

x) The latus rectum of the parabola  $y^2 = -16x$  is

- a) 4
- b) - 4
- c) 16
- d) none of these.

xi) The derivative of  $x \log x$  is

- a)  $1 + \log x$
- b)  $1 - \log x$
- c)  $\log x$
- d) none of these.

xii) The derivative of  $xe^x$  is

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



xiii) If  $\sqrt{x} + \sqrt{y} = 1$  then  $\left(\frac{dy}{dx}\right)x =$

a) - 1

b) 1

c) 3

d) - 3.

xiv)  $\int 0 \cdot dx$  is equal to

a) 0

b)  $x$

c)  $dx$

d) constant.

### GROUP – B

#### ( Short Answer Type Questions )

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

2. Verify Euler's Theorem for the function  $V(x, y) = \frac{x^3 + y^3}{x^2 + y^2}$ .

3. Find  $\text{Adj } A$  and  $A^{-1}$  of the matrix  $A$ , if  $A = \begin{bmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & -1 \end{bmatrix}$ .

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

$$2x - z = 1$$

$$2x + 4y - z = 1$$

$$x - 8y - 3z = -2.$$



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5. Find the co-ordinates of the vertex, length of the latus rectum and the equation of the directrix of the parabola

$$x^2 + 4x + 2y - 11 = 0.$$

6. Find  $\frac{dy}{dx}$  if  $y = x^x$ .

7. If the area of the circle increases at a uniform rate, show that

the rate of increase of the circumference of the circle varies

inversely as the radius.

### GROUP – C

#### ( Long Answer Type Questions )

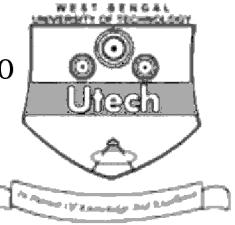
Answer any *three* of the following.  $3 \times 15 = 45$

8. a) Prove that

$$\begin{vmatrix} a^2 + b^2 & ac & bc \\ ca & c^2 + a^2 & ab \\ bc & ab & b^2 + c^2 \end{vmatrix} = \begin{vmatrix} a & b & 0 \\ c & 0 & a \\ 0 & c & b \end{vmatrix}^2$$

- b) The vertices of an ellipse are  $(-1, 2)$  and  $(9, 2)$ . If the distance between its foci be 8, find the equation of the ellipse.

- c) Find the value of  $\int x \log(1+x) dx$ .  $5 + 5 + 5$



9. a) A function is defined as follows :

$$f(x) = x^2 \text{ for } x > 1$$

$$= 2 \text{ for } x = 1$$

$$= x \text{ for } x < 1.$$

Find  $\lim_{x \rightarrow 1} f(x)$

b) Evaluate :  $\int_0^1 \sin^{-1} \left( \frac{2x}{1+x^2} \right) dx$

c) If  $ax^2 + 2hxy + by^2 = 1$ , show that  $\frac{d^2y}{dx^2} = \frac{h^2 - ab}{(hx + by)^2}$ .

5 + 5 + 5

10. a) Evaluate :  $\int \frac{x^2 dx}{\sqrt{1+x^3}}$

b) If  $y = a \sin(mx) + b \cos(mx)$ , then prove that  $\frac{d^2y}{dx^2} = m^2 y$ .

c) If  $V = \sin^{-1} \left( \frac{x^2 + y^2}{x + y} \right)$ , then show that  $xV_x + yV_y = \tan V$ .

5 + 5 + 5

11. a) Prove that  $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix} = 0$

b) For the matrix  $A = \begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$  show that  $A^2 - 5A + 7I_2 = 0$

and hence find  $A^{-1}$ .

7 + 8



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12 a) Solve by matrix inversion method  $x + y + z = 6$ ,

$$x - y + z = 2, 2x + y - z = 1.$$

b) Prove that the matrix  $A = \frac{1}{3} \begin{bmatrix} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$  is an orthogonal matrix and hence find  $A^{-1}$ . 8 + 7

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