

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/BBA (H)/BIRM/BSCM/SEM-2/BBA-202/2011**

**2011**

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

- a)  $e$
- b)  $\frac{1}{e}$
- c) 0
- d) 1.

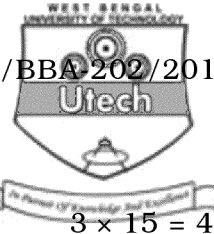
ii) The derivative of  $xe^x$  is

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









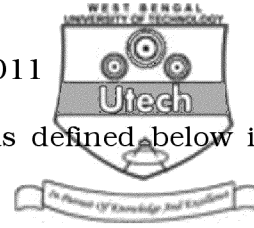
**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.

3 × 15 = 45

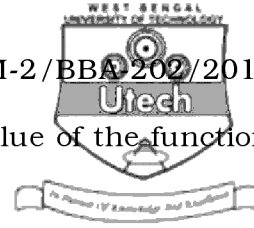
8. a) If  $x + y + z = 0$ , then show that  $\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^3 & y^3 & z^3 \end{vmatrix} = 0$ .
- b) Show that the matrix  $A = \begin{pmatrix} 2 & -3 & 1 \\ 3 & 1 & 3 \\ -5 & 2 & -4 \end{pmatrix}$  satisfies the equation  $A(A - I)(A + 2I) = 0$ .
- c) Compute the inverse of the matrix  $A = \begin{pmatrix} 2 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{pmatrix}$ .
9. a) Verify whether the following matrix  $A = \frac{1}{3} \begin{pmatrix} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$  is orthogonal or not. Find  $A^{-1}$ .
- b) Solve the following system of equation by matrix inversion method :
- $$x + y + z = 6$$
- $$x - y + z = 2$$
- $$2x + y - z = 1$$
- c) Find the value of  $t$  for which the matrix  $\begin{pmatrix} 2 & 0 & 1 \\ 5 & t & 3 \\ 0 & 3 & 1 \end{pmatrix}$  is singular.



10. a) Verify whether the function  $f(x)$  as defined below is continuous or not at  $x = 2$ .

$$f(x) = \begin{cases} x^2 + 4, & x > 2 \\ 8, & x = 2 \\ 3x^2 - 4 & x < 2 \end{cases}$$

- b) Find  $\frac{d^2y}{dx^2}$  if  $x = \frac{t^2}{1+t}$   $y = \frac{t}{1+t}$ .
- c) If  $y = \sin(m \sin^{-1} x)$  then show that  $(1 - x^2)y_2 - xy_1 + m^2y = 0$ .
11. a) If  $y = a \sin(mx) + b \cos(mx)$  then show that  $\frac{d^2y}{dx^2} = m^2y$ .
- b) If  $A = \begin{pmatrix} 2 & 4 \\ 1 & 3 \end{pmatrix}$  and  $B = \begin{pmatrix} -1 & 0 \\ 5 & 1 \end{pmatrix}$  then verify that  $(AB)^{-1} = B^{-1}A^{-1}$ .
- c) Prove that  $\sqrt{3} \sin x + 3 \cos x$  has a maximum at  $x = \frac{\pi}{6}$ .
12. a) If  $u = x^2 + y^2 + z^2$  then show that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 2u$ .
- b) Find the equation of the ellipse which meets the straight line  $\frac{x}{7} + \frac{y}{2} = 1$  on the  $x$ -axis and the straight line  $\frac{x}{3} + \frac{y}{5} = 1$  on the  $y$ -axis and whose axes lie along the axes of coordinates. Determine the foci of the ellipse.
- c) Evaluate  $\int e^x \left( \frac{1}{x} - \frac{1}{x^2} \right) dx$ .



13. a) Find the maximum and minimum value of the function

$$f(x) = x^3 + \frac{1}{x^3}.$$

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

- c) Find the area above the X-axis bounded by  $x - 2y + 4 = 0$ ,  $x = 1$  and  $x = 9$ .
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