MATHEMATICS – II (SEMESTER - 2)

CS/BBA (H), BIRM, BSCM/SEM-2/BBA-202/09

1. ....
   Signature of Invigilator

2. ....   ***Reg. No.***
   Signature of the Officer-in-Charge

Roll No. of the Candidate

CS/BBA (H), BIRM, BSCM/SEM-2/BBA-202/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
MATHEMATICS – II (SEMESTER - 2)

Time : 3 Hours]   [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.

2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question.**

   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.

3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.

4. Read the instructions given inside carefully before answering.

5. You should not forget to write the corresponding question numbers while answering.

6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.

7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**

8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.

9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY
Marks Obtained

	Group – A										Group – B		Group – C			
Question Number															**Total Marks**	**Examiner's Signature**
Marks Obtained																

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Head-Examiner/Co-Ordinator/Scrutineer

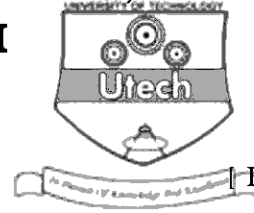DO NOT WRITE ON THIS PAGE

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GROUP – A

(Multiple Choice Type Questions)

1.   Choose the correct alternatives for any *ten* of the following :   10 × 1 = 10

   i)   If $y = 3x$, then $\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2}$ is

   a)   0   b)   1

   c)   2   d)   3.

   ii)   The value of $\lim\limits_{x \to \infty} \left(1 + \dfrac{1}{x}\right)^x$ is

   a) e b) $1/e$

   c)   0   d)   1.

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

   a) $\dfrac{1}{2a} \log \dfrac{a+x}{a-x}$ b) $\sin^{-1} \dfrac{x}{a}$

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

   iv)   The co-factor of '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.
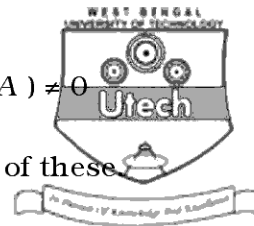
v)   The matrix A is said to be orthogonal matrix if

a)   det $(A) = 0$ b)   det $(A) \neq 0$

c) $A^T A = I$ d)   none of these.

vi)   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.

vii)   The value of the determinant $\begin{vmatrix} 3 & 4 & 5 \\ (\sqrt{3})^2 & 2^2 & (\sqrt{5})^2 \\ 4 & 5 & 6 \end{vmatrix}$ is equal to

a)   1   b)   2

c)   23   d)   0.

viii) $\dfrac{d}{dx}(10^x)$ is equal to

a) $10^x \log_{10} e$ b)   10

c) 10^x d) $x.10^{x-1}$.

ix)   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.

x)   If $y = x \log x$, then $\dfrac{dy}{dx}$ is equal to

a) $1 + \log x$ b) x

c) $\dfrac{1}{x}$ d)   1.

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

a) $(3, 0)$ b) $(9, 0)$

c) $(3, 9)$ d)   none of these.

xii) The value of $\int x\, e^x\, dx$ is

a) $x\, e^x$

b) $e^x\,(x-1)$

c) $x\, e^x + x$

d) none of these.
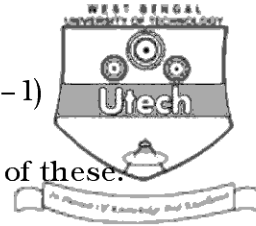
xiii) Parametric co-ordinates of the parabola $y^2 = 4ax$ is

a) $\left(-at^2, -2at\right)$

b) $\left(-at^2, 2at\right)$

c) $\left(at^2, 2at\right)$

d) none of these.

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

a) $\dfrac{1}{4}$

b) $\dfrac{3}{4}$

c) $\dfrac{1}{2}$

d) $\dfrac{\sqrt{3}}{2}$.

GROUP – B

(Short Answer Type Questions)

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

2. Solve the following system of equations by the matrix method :

$x + y + z = 8$

$x - y + 2z = 6$

$3x + 5y - 7z = 14$

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

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

5. Find the value of $A^2 - 4A - 5I$, if $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$.

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

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. $3 \times 15 = 45$
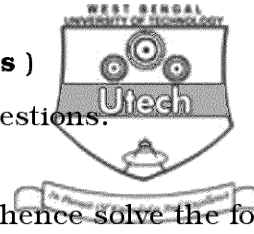
7. a) Obtain the inverse of the matrix $\begin{bmatrix} 2 & 4 & -1 \\ 3 & 1 & 2 \\ 1 & 3 & -3 \end{bmatrix}$ and hence solve the following system

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) Find the equation of the ellipse which meets the straight line $\dfrac{x}{7}+\dfrac{y}{2}=1$ on the axis of x and the straight line $\dfrac{x}{3}+\dfrac{y}{5}=1$ on the axis of y and whose axis lie along the axes of co-ordinates. Determine the eccentricity and the co-ordinates of the foci of the ellipse. $6 + 2 + 7$

8. a) Find the maximum value of $\left(\dfrac{1}{x}\right)^x$.

  b) Evaluate the integral $\displaystyle\int \dfrac{x^2\,dx}{\sqrt{1+x^3}}$. $8 + 7$

9. a) Evaluate $\displaystyle\lim_{n \to \infty} \dfrac{1^m + 2^m + 3^m + ... + n^m}{n^{m+1}}$ $(m > -1)$.

  b) If $y = a \sin (mx) + b \cos (mx)$, then prove that $\dfrac{d^2 y}{dx^2} = m^2 y$. $8 + 7$

10. a) Find the equation of the normal to the parabola $y^2 = 3x$ which is perpendicular to $y = 2x + 4$.

  b) If $A = \begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 0 \\ 5 & 1 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1} A^{-1}$.

  c) If $x = a \cos 2t$, $y = a \sin 2t$, then find $\dfrac{d^2 y}{dx^2}$. $5 + 6 + 4$

11. a) Prove that the matrix $A = \dfrac{1}{3}\begin{bmatrix} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ is an orthogonal matrix and hence

find A^{-1}.

   b) Evaluate the integral $\displaystyle\int \frac{e^x}{x}\left(x\log x + 1 \right)dx$.   8 + 7

12. a) Find the equation of the parabola whose vertex is $(-1, 3)$ and the focus is $(3, -1)$.

   b) Taking the major and minor axes as the axes of the co-ordinates, find the equation of the ellipse whose length of latus rectum is $\dfrac{32}{5}$ units and co-ordinates of one focus are $(3, 0)$.

   c) If S and $S^{/}$ are the foci and P be any point on the hyperbola $x^2 - y^2 = a^2$, prove that $SP \cdot S^{/}P = CP^2$, where C is the centre of the hyperbola.   5 + 5 + 5

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END