CS/BCA/SEM-4/BM-401/09

1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

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CS/BCA/SEM-4/BM-401/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
STATISTICS, NUMERICAL METHODS & ALGORITHMS (SEMESTER - 4)

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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Marks Obtained

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

.....
Head-Examiner/Co-Ordinator/Scrutineer

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GROUP – A

(Multiple Choice Type Questions)

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

i) Inverse of a matrix A is given by

a) A^{-1} = Adj. of A / Det. A b) A^{-1} = Det. A / Adj. A

c) A^{-1} = Det. A d) none of these. ☐

ii) Newton's forward interpolation formula is used for

a) equispaced values b) unequispaced values

c) both (a) and (b) d) none of these. ☐

iii) A matrix is said to be lower triangular, if and only if,

a) all the elements in the principal diagonal are zero

b) all the elements above the principal diagonal are zero

c) all the elements below the principal diagonal are zero

d) none of these. ☐

iv) Which of the following relations is true ?

a) $1 + \Delta = E$ b) $3 + E = \Delta$

c) $2 + \Delta = E$ d) None of these. ☐

v) For $\frac{dy}{dx} = f(x, y)$ with $y(x_0) = y_0$

$$y(x) = y(x_0) + h / y'(x_0) + h^2 y''(x_0) / 2! + \ldots$$

is given by

a) Euler's series method b) Taylor's series method

c) Runge-Kutta method d) None of these.

vi) If $f(x) = 2x^3 - 3x^2 + 4x + 5$, then $\Delta^3 f(x)$ is

a) 8 b) 10

c) 200 d) 100.

vii) One of the roots of the equation $x^2 + 2x - 2 = 0$ lies in between

a) 1 and 2 b) 0 and 0·5

c) 0·5 and 1 d) none of these.

viii) The first order forward difference of a constant function is

a) 0 b) 3

c) 1 d) 4.

ix) The order of convergence of Newton-Raphson method is

a) 3 b) 2

c) 1 d) 4.

x) By evaluating $\int_0^1 \frac{dx}{1 + x^2}$ by numerical integration method we can approximate the value by

a) e b) $\log_{10} 2$

c) $\log_e 2$ d) $\frac{\pi}{4}$.

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xi) If $f(x) = 99$ and $h = 1$, then $\Delta f(x)$ is equal to

a) 100 b) 1

c) 0 d) 98.

xii) Newton's forward interpolation formula uses

a) the front part of the table b) the end part of the table

c) any part of the table d) precisely the middle of the table.

xiii) When rounded off after 4 decimal places 0·003256 becomes

a) 0·0032 b) 0·0033

c) 0·0326 d) none of these.

xiv) If $y_0 = 3$, $y_1 = 5$, $y_2 = 6$ and $y_4 = 28$, then y_3 is

a) 10 b) 11·75

c) 12·62 d) = 10·38

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following questions. 3 × 5 = 15

2. Use Lagrange's interpolation to express y as a function of x from the following table :

x	0	1	3	4
y	– 12	0	6	12

3. Prove that $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$.

4. Evaluate $\int_0^5 \frac{dx}{1+x}$ by Trapezoidal rule taking $h = 1$.

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5. If D stands for the differential operator $\left(\frac{d}{dx}\right)^6$, prove that

$$D \equiv \frac{1}{h}\left(\Delta - \frac{\Delta^2}{2} + \frac{\Delta^3}{3} - \ldots\ldots\right) .$$

6. Solve by Gauss elimination method the following system of equations :

$$2x + y + 4z = 16$$

$$3x + 2y + z = 10$$

$$x + 3y + 3z = 16.$$

GROUP – C

(Long Answer Type Questions)

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

7. a) For few values of x, the corresponding values of $f(x)$ are as follows :

x	4	5	6	7
$f(x)$	3·11	2·96	2·85	2·70

Using appropriate interpolation formula find the value of $f(6{\cdot}5)$.

b) Find the missing figure in the following :

x	5·1	5·2	5·3	5·4	5·5
y	—	0·110	0·100	0·090	0·082

c) Find the real root of $xe^x - 2 = 0$ correct upto three places of decimals using Newton-Raphson method. 5 + 5 + 5

8. a) Find the inverse of the following matrix by Gauss Elimination method :

$$\begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$$

b) Find $\frac{dy}{dx}$ at $x = 0{\cdot}5$ from the following data :

x	0	1	2	3	4
y	1	1	15	40	85

8 + 7

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9. a) Find the cubic function $f(x)$ from the following data :

x	0	1	2	4
$f(x)$	1	4	14	85

b) Find the values of y at $x = 21$ and $x = 28$ from the following data :

x	20	23	26	29
$f(x)$	0·3420	0·3907	0·4384	0·4848

7 + 8

10. a) Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ by dividing the range into 10 equal parts and applying Simpson's one-third rule.

b) Compute $y(0{\cdot}1)$ by Runge-Kutta method of fourth order for the differential equation

$$\frac{dy}{dx} = xy + y^2, \quad y(0) = 1.$$

8 + 7

11. a) Find a root of the equation $\sin x + \cos x = 1$, by Regula Falsi method up to 4 places of decimal.

b) From the following table compute y for $x = 1{\cdot}25$ by using Newton's divided difference formula correct up to 4 decimal places :

x	1·0	1·1	1·3	1·5	1·6
y	0·3639	0·3258	0·2612	0·2095	0·1876

7 + 8

END

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