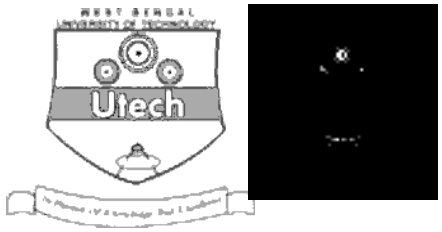
CS/B.TECH (AUE-N)/SEM-4/AUE-401/09



1. .....
Signature of Invigilator

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

Reg. No.

Roll No. of the Candidate

CS/B.TECH (AUE-N)/SEM-4/AUE-401/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ENGINEERING ANALYSIS & NUMERICAL METHODS (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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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

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ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ENGINEERING ANALYSIS & NUMERICAL METHODS

SEMESTER – 4

Time : 3 Hours] [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

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

i) Newton's interpolation formula can be used only for equal intervals.

a) True

b) False.

ii) Lagrange's interpolation formula can be used only for equal intervals.

a) True

b) False.

iii) The error in composite Simpon's $\frac{1}{3}$rd rule is of ..... order.

a) h^3 b) h^4

c) h^5 d) none of these.

iv) The shift operator E is equal to

a) $1 + \Delta$ b) $(1+\Delta)^{-1}$

c) $1 - \Delta$ d) $1-\Delta^2$.

v) $(\Delta - \nabla)x^2$ is equal to

a) h^2 b) $-2h^2$

c) $2h^2$ d) none of these.

vi) The error in 4th order Runge-Kutta method is of order

a) h^3 b) h^4

c) h^5 d) none of these.

vii) The partial differential equation $u_{xx} + u_{yy} = f(x, y)$ is called

a) Heat equation b) Wave equation

c) Laplace equation d) Poisson's equation.

viii) Which of the following is not true (the notation have their usual meaning) ?

a) $\Delta = E - 1$ b) $\Delta \cdot \nabla = \Delta - \nabla$

c) $\frac{\Delta}{\nabla} = \Delta + \nabla$ d) $\Delta = 1 - E^{-1}$.

ix) The error in the trapezoidal rule for $\int_{10}^{20} f(x)\,dx$ (where the number of sub-interval is 10) is

a) $-\frac{h^3}{12} f''(\xi)$ b) $-\frac{h^3}{12} f'(\xi)$

c) $-\frac{h}{12} f''(\xi)$ d) $-\frac{h^2}{12} f''(\xi)$

where h is the length of each sub-intervals and $a < \xi < b$.

x) For the differential equation $\frac{dy}{dx} = 1 - y,\ y(0) = 0$ the value of y (0·2) =

a) 0·1 b) 0·2

c) 0·01 d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. Find the root of the equation $3x - \cos x - 1 = 0$, by the iteration method, correct to four significant figures.

3. Compute the values of the unknown in the system of equations by Matrix-Inversion method :

$$x_1 + 3x_2 + 2x_3 = 17$$

$$x_1 + 2x_2 + 3x_3 = 16$$

$$2x_1 - x_2 + 4x_3 = 13.$$

4. Evaluate $\int_0^5 \frac{dx}{3+x^2}$, by trapezoidal rule, taking $h = 1$.

5. Compute $f'(1{\cdot}2)$ and $f''(1{\cdot}2)$ from the following table :

x :	1	2	3	4	5
$f(x)$:	0	1	5	6	8

6. Use Stirling's formula to find $f(35)$ from the following table :

x :	20	30	40	50
$f(x)$:	512	439	346	243

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. 3 × 15 = 45

7. a) Establish Newton's interpolation formula using forward differences when the functional values of $y = f(x)$ are known at $(n + 1)$ equispaced points.

b) Compute $f(0{\cdot}5)$ and $f(2{\cdot}8)$ from the following table :

x :	0	1	2	3
$f(x)$:	1	2	11	34

7 + 8

8. a) Explain Gauss elimination process for solving a system of three linear equations with three unknowns.

b) What do you mean by a system $n \times n$ strictly diagonally dominant equations ?

c) Solve, by Gauss-Seidel iteration method, the system,

$3x_1 + 9x_2 - 2x_3 = 11$

$4x_1 + 2x_2 + 13x_3 = 24$

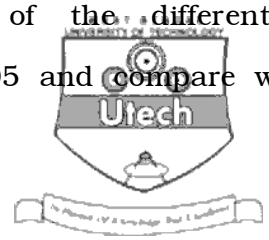
$4x_1 - 2x_2 + x_3 = -8$. 6 + 2 + 7

9. a) Solve the equation $y'' = x + y$ with boundary conditions $y(0) = y(1) = 0$.

b) Use Newton-Raphson method to solve the system of equations $x^2 + y^2 + xy = 7$ and $x^3 + y^3 = 9$.

Take the initial approximation as $x_0 = 1{\cdot}5$ and $y_0 = 0{\cdot}5$. 6 + 9

10. a) Using Euler's method find the solution of the differential equation $\frac{dy}{dx} = x^2 - y, y(0) = 1$ for x = 0·3 taking h = 0·05 and compare with its exact solution.



b) Compute y (0·1), y (0·2), y (0·3) from the following differential equation : $\frac{dy}{dx} = x + y, y(0) = 1$ taking h = 0·1. 8 + 7

11. a) Evaluate the integral $I = \int_0^1 \frac{dx}{1+x}$ using Gaussian two and three point integration rule. Compare with the exact solution.

b) Evaluate the following integral $I = \int_{y=1}^{2} \int_{x=1}^{3} (x^2 + y^2)\, dx\, dy$, using Simpson's $\frac{1}{3}$rd rule with the length of sub-interval h = 0·5 (along x-axis) and K = 0·5 (along y-axis).
(7 + 1) + 7

END