



ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER - 2007
NUMERICAL METHODS AND PROGRAMMING
SEMESTER - 3

Time : 3 Hours]

[Full Marks : 70

GROUP - A

(Multiple Choice Type Questions)

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

- 1) The no. of significant digits in 1.00234 is

- a) 4 b) 6
c) 3 d) 5.

- ii) Which of the following relations is / are true ?

- a) $\Delta \cdot \nabla = \Delta - \nabla$ b) $\Delta \cdot \nabla = \Delta + \nabla$
c) $\Delta \cdot \nabla = \Delta / \nabla$ d) all of these.

- iii) The output of the following program will be :**

```
#include<stdio.h>

main( )

{

    int i = 0, x = 0 ;

    while ( i < 0 ) {

        if ( i%5 == 0 ) {

            x + = 1 ; }

        ++ i ; }

    printf( "\nx = %d", x ) ;

}
```

- a) 25 b) 30
c) 35 d) none of these.

□

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- Figure 1 shows a schematic diagram of a rectangular domain. The domain is bounded by $x=0$, $x=1$, $y=0$, and $y=1$. A grid of points is shown, with a central point labeled i . The points are arranged in a regular grid pattern.

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- Figure 1 shows a schematic diagram of a rectangular domain. The domain is divided into two regions by a horizontal line. The top region is labeled 'a' and the bottom region is labeled 'b'. The horizontal line is labeled 'c' and the vertical line is labeled 'd'.



- a) 2 b) 4
c) 3 d) 5.



xi) When Gauss Elimination method is used to solve $AX = B$, A is transformed to a

- a) null matrix b) upper triangular matrix
c) identity matrix d) diagonally dominant matrix.

xii) If $\frac{dy}{dx} = x + y$ and $y(1) = 0$, then $y(1.1)$ according to Euler's method is
[$h = 0.1$].

- a) 0.1 b) 0.3
c) 0.5 d) 0.9.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following.

$3 \times 5 = 15$

2. Given the following table, find $f(x)$ and hence find $f(6)$:

$x :$	0	1	2	3	4	5
$f(x) :$	41	43	47	53	61	71

3. The values of $\sin x$ are given below, for different values of x . Form a difference table and from this table find the $\sin 32^\circ$.

$x :$	30°	35°	40°	45°	50°	55°
$y = \sin x :$	0.5000	0.5736	0.6428	0.7071	0.7660	0.8192

4. What are subscripts ? How are they written ? What restrictions apply to the values that can be assigned to subscripts ?

5. Evaluate $\sqrt{12}$ to three places of decimals by Newton-Raphson method.

6. Find a root of the equation $x^3 - 3x - 5 = 0$ by the method of false position.

7. Find A^{-1} , if $A = \begin{pmatrix} 8 & -4 & 0 \\ -4 & 8 & -4 \\ 0 & -4 & 8 \end{pmatrix}$

by Gauss-Jordan method.

**GROUP - C****(Long Answer Type Questions)**

Answer any three of the following questions.

3 × 15 = 45

8. a) Find by the method of fixed point iteration the root of $x^2 - 6x + 2 = 0$, which lies between 5 and 6 correct upto four significant figures.
- b) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition $y = 1$ at $x = 0$, find y for $x = 0.1$ by Euler's method, correct upto 4 decimal places, taking step length $h = 0.02$.

10 + 5

9. a) Solve the following system of linear equations by Gauss-Jordan elimination method :

$$5x_1 - x_2 = 9$$

$$-x_1 + 5x_2 - x_3 = 4$$

$$-x_2 + 5x_3 = -6$$

- b) Calculate by Simpson's $\frac{1}{3}$ rule, the value of the integral $\int_0^1 \frac{x}{1+x} dx$, correct upto three significant figures by taking six intervals.

10 + 5

10. a) Solve the following system of equations by LU-factorization method :

$$8x_1 - 3x_2 + 2x_3 = 20 ; 4x_1 + 11x_2 - x_3 = 33 ; 6x_1 + 3x_2 + 12x_3 = 36.$$

- b) Using Gauss-Seidel method, find the solution of the following system of the linear equations correct upto 2 place of decimal.

$$3x + y + 5z = 13, 5x - 2y + z = 4, x + 6y - 2z = -1.$$

8 + 7

11. a) Find $f(0.9)$ by using Newton divided difference formula. Given

x :	0	1	2	4
f(x) :	5	14	41	98

- b) Estimate the missing values from the following table :

x :	1	3	5	7	9	11
y :	2	?	27	64	?	216

State the necessary assumption.



c) Find $y'(1.1)$, given that

$x :$	1.0	1.1	1.2	1.3	1.4
$y(x) :$	7.989	8.403	8.781	9.129	9.451

5 + 5 + 5

12. a) Solve the equation $\frac{dy}{dx} = x^2 + y^2$; $y(0) = 1$, for $x = 0.1$ by using Runge-Kutta 4th order method and find the solution correct upto 4 place of decimal. ($h = 0.05$)

b) Find the solution of the following differential equation by Euler's method for $x = 1$, by taking $h = 0.2$, $\frac{dy}{dx} = xy$, with $y = 1$ when $x = 0$.

c) Using Taylor's series method solve $\frac{dy}{dx} = 1 + xy$ with $y(0) = 2$. Find the value of $y(0.2)$.

6 + 5 + 4

13. a) Write a program in C to solve the equation $x^3 - x - 4 = 0$ within $(1, 2)$ by Bisection method, correct upto 3 place of decimals.

b) Solve the equation $\frac{dy}{dx} = x + y$ with initial condition $y(0) = 1.0$ and $h = 0.1$, using predictor-corrector method, to find $y(0.2)$.

c) Write a program in C using recursive function to calculate the sum of all digits of any number.

6 + 5 + 4

END