



Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH(OLD) / ECE,EEE,IT,ICE / SEM-3 / M(CS)-312 / 2011-12

2011

NUMERICAL METHODS AND PROGRAMMING

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)

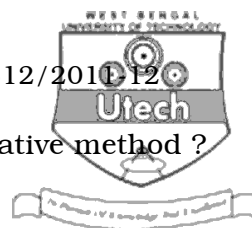
1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

- i) Which of the following digits is not significant of the number 0.025 ?

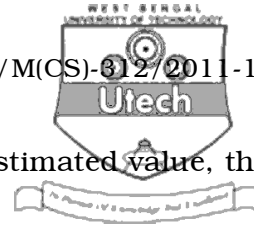
- | | |
|------|-------------------|
| a) 0 | b) 2 |
| c) 5 | d) None of these. |

- ii) Which of the following relations is true ?

- | | |
|---------------------|---------------------|
| a) $1 + \Delta = E$ | b) $3 + E = \Delta$ |
| c) $2 + \Delta = E$ | d) none of these. |



- iii) Which of the following methods is iterative method ?
- Gauss Elimination Method
 - Gauss-Jordan Method
 - Gauss Jacoby Method
 - Crout's Method.
- iv) The order of convergence of Newton-Raphson method is
- 3
 - 2
 - 1
 - 4
- v) If $f(3) = 5$ and $f(5) = 3$. then the linear interpolation function $f(x)$ is
- $f(x) = 8 + x$
 - $f(x) = x^2$
 - $f(x) = 8 - x$
 - $f(x) = x + x^2 + 8$
- vi) $(\Delta - \nabla)x^2$ is equal to (the notations have their usual meanings)
- h^2
 - $-2h^2$
 - $2h^2$
 - none of these
- vii) In Simpson's $\frac{1}{3}$ -rd rule, the portion of curve is replaced by
- straight line
 - circular path
 - parabolic path
 - none of these.



viii) If c be the actual value and e be its estimated value, the formula for relative error is

- | | |
|----------------------|----------------------|
| a) $\frac{a}{e}$ | b) $\frac{ a-e }{a}$ |
| c) $\frac{(e-a)}{e}$ | d) $\frac{ a-e }{e}$ |

ix) In the method of iteration the function

$\phi(x)$ must satisfy

- | | |
|---------------------|---------------------|
| a) $ \phi'(x) < 1$ | b) $ \phi'(x) > 1$ |
| c) $ \phi'(x) = 1$ | d) $ \phi'(x) = 2$ |

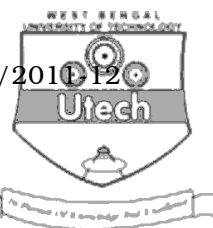
x) Find the output of the following program :

```
main ( )
{
    char a, b ;
    a = 'b'
    b = a;
    printf ( "b = %c\n", b);
}
```

- | | |
|------------------|-------------------|
| a) a | b) b |
| c) garbage value | d) none of these. |

xi) The inherent error for Simpson's $\frac{1}{3}$ rd rule of integration is as (the notations have their usual meanings)

- | | |
|---------------------------------|---------------------------------|
| a) $-\frac{nh^5}{180} f''(x_0)$ | b) $-\frac{nh^5}{140} f''(x_0)$ |
| c) $-\frac{nh^3}{12} f''(x_0)$ | d) none of these. |

**GROUP – B****(Short Answer Type Questions)**

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

2. From the following table find the values of $f(12)$ by Newton's divided difference interpolation formula :

$x :$	11	13	14	18	19	21
$f(x) :$	1342	2210	2758	5850	6878	9282

3. Solve the following system by Gauss Elimination Method.

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

$$3x + 2y + 3z = 18$$

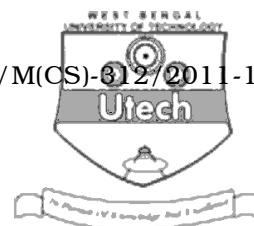
$$x + 4y + 9z = 16.$$

4. Find $\frac{d^2y}{dx^2}$ at $x = 7$ using the following table :

$x :$	0	2	4	6	8
$f(x) :$	3	9	17	21	35

5. Find the first approximation of the root lying between 0 & 1 of the equation $x^3 + 3x - 1 = 0$ by Newton-Raphson formula.
6. Solve by using Euler's method the following differential equation for $x = 1$ by taking $h = 0.2$

$$\frac{dy}{dx} = xy, \quad y = 1 \text{ when } x = 0$$



GROUP – C

(Long Answer Type Questions)

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

7. a) Express $x^4 - 3x^2 + 1$ in factorial notation.
 - b) Prove that third difference of a third degree polynomial is constant.
 - c) Write a C program to solve the equation $x^3 - 3x - 5 = 0$ within (1, 2) by Bisection method correct up to 3 places of decimal.
- $5 + 5 + 5$
8. a) Solve the following system of equation, correct to four places of decimals by Gauss- Seidel iteration method :

$$x + y + 54z = 110$$

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$



- b) Find the value of $y(0.1)$, $y(0.2)$ and $y(0.3)$ using Runge-Kutta Method of the fourth order, given that

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

8 + 7

9. a) Find two missing term from the following distribution.

$x :$	0	1	2	3	4
$y :$	1	*	9	*	81

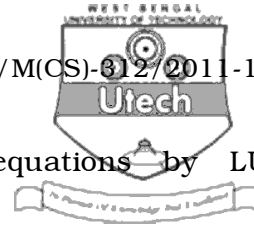
- b) Write a program in C using recursive function to calculate the sum of all digits of any number.
- c) Find the root of the equation $x^3 + x^2 + x + 7 = 0$ using Regulas Falsi method.

5 + 5 + 5

10. a) Write a C program to interpolate a given function at a specified argument by Divided difference interpolation formula.
- b) Write a C program to approximate a real root of the following equation :

$$4 \cos x = e^{2x} \text{ by Bisection method.}$$

8 + 7



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

$$2x - 6y + 8z = 24$$

$$5x + 4y - 3z = 2'$$

$$3x + y + 2z = 16$$

- b) Write a program in C using recursive function to calculate the GCD of any two given numbers. 8 + 7

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