



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 )**

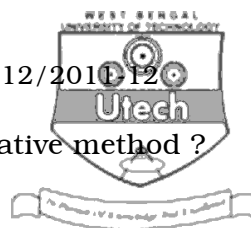
1. Choose the correct alternatives for any *ten* of the following :  $10 \times 1 = 10$

- 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 ?

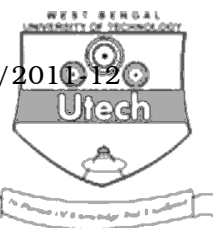
- |                     |                     |
|---------------------|---------------------|
| a) $1 + \Delta = E$ | b) $3 + E = \Delta$ |
| c) $2 + \Delta = E$ | d) none of these.   |



- 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.

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- a)  $\frac{a}{e}$
- b)  $\left| \frac{a-e}{a} \right|$
- c)  $\frac{(e-a)}{e}$
- d)  $\left| \frac{a-e}{e} \right|$
- ix) In the method of iteration the function  $\phi(x)$  must satisfy
- a)  $\left| \phi'(x) \right| < 1$
- b)  $\left| \phi'(x) \right| > 1$
- c)  $\left| \phi'(x) \right| = 1$
- d)  $\left| \phi'(x) \right| = 2.$
- 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.

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

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

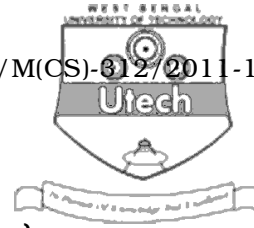
$$x + 4y + 9z = 16.$$

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 )**

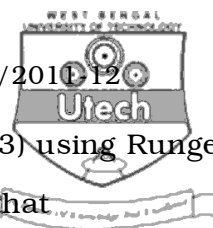
Answer any *three* of the following.  $3 \times 15 = 45$

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.
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.

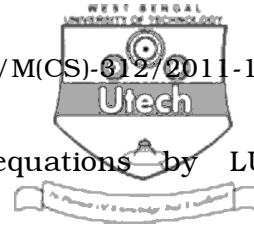
5 + 5 + 5

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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