

Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech (IT,ECE,EEE,ICE)/SEM-3/M(CS)-312/2010-11

2010-11

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) The ratio of absolute error of the true value is called

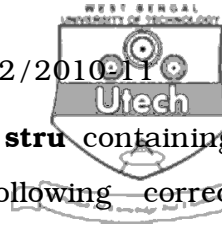
- | | |
|---------------------|--------------------|
| a) relative error | b) absolute error |
| c) truncation error | d) inherent error. |

ii) The significant digit of 0.0001234 is

- | | |
|------|-------|
| a) 7 | b) 4 |
| c) 8 | d) 6. |

iii) The percentage error in approximating $4/3$ to 1.3333 is

- | | |
|-------------|----------|
| a) 0.0025% | b) 25% |
| c) 0.00025% | d) 0.25% |



iv) Given a pointer, **ptr** to a structure **stru** containing a member name. Which of the following correctly references **name** ?

- a) `ptr → stru → name` b) `ptr.name`
 c) `ptr → stru.name` d) `ptr.str.name`

v) With every use of a memory allocation function, what function should be used to release allocated memory which is no longer needed ?

- a) `unalloc()` b) `free()`
 c) `dealloc()` d) `dropmem()`.

vi) Which operator cannot be overloaded ?

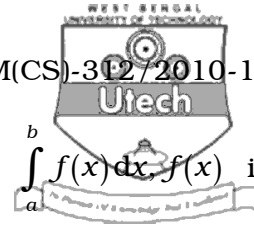
- a) `cout` b) `cin`
 c) `++` d) `::`

vii) Which one of the following will read a character from the keyboard and will store in the variable `c` ?

- a) `c=getc()`; b) `getc(&c)`;
 c) `getchar(&c)`; d) `c=getchar()`;

viii) If the interval of differencing in unity and $f(x)=ax^2$ (a is constant), which one of the following choices is wrong ?

- a) $\Delta f(x)=a(2x+1)$ b) $\Delta^2 f(x)=2a$
 c) $\Delta^3 f(x)=2$ d) $\Delta^4 f(x)=0$.



ix) In Simpson's 1/3 rule of finding $\int_a^b f(x) dx$, $f(x)$ is approximated by

- a) line segment b) parabola
c) circular sector d) part of ellipse.
- x) If $f(0)=12$, $f(3)=6$ and $f(4)=8$, then the linear interpolation function $f(x)$ is

- a) $x^2 - 3x + 12$ b) $x^2 - 5x$
c) $x^3 - x^2 - 5x$ d) $x^2 - 5x + 12$.

xi) Runge-Kutta formula has a truncation error which is of the order of

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

xii) If $f(x) = \frac{1}{x^2}$, then the dividend difference $f(a, b)$ is

- a) $\frac{a+b}{(ab)^2}$
b) $-\frac{a+b}{(ab)^2}$
c) $\frac{1}{a^2 - b^2}$
d) $\frac{1}{a^2} - \frac{1}{b^2}$.

**GROUP – B****(Short Answer Type Questions)**Answer any *three* of the following.

$$3 \times 5 = 15$$

2. Values of x (in degrees) and $\sin x$ are given in the following table :

x (in degree)	15	20	25	30	35	40
$f(x)$	0.2588190	0.3420201	0.4226183	0.5	0.5735764	0.6427876

Determine the value of $\sin 38^\circ$ by Newton's backward difference interpolation formula.

3. Find the positive real root of $x^3 - x^2 - 1 = 0$ using the bisection method of 4 iterations.
4. Estimate the value of the integral by Simpson's 1/3 rule, taking 4 strips.

$$\int_1^3 \frac{1}{x} dx$$

5. Solve by Taylor's series method $dy/dx = 1/(x^2 + y)$ where $y(4) = 4$. Compute the values of y (4.1).
6. Solve the system of linear equations by Gauss-Jordan method :

$$2x + y + z = 0$$

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

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



GROUP – C

(Long Answer Type Questions)

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

7. a) Write a C program to multiply two matrices of order 3×3 by using pointer method. What do you mean by recursive function ? Explain with the help of example.
- b) Using matrix factorization method solve the following system of equations :

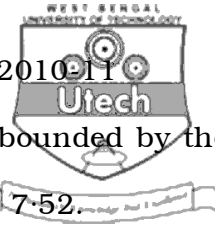
$$x + 3y + z = 9$$

$$x + 4y + 2z = 3$$

$$x + 2y - 3z = 6.$$

$$7 + 8$$

8. a) Write a program in C to copy the contents of a text file to another text file. Suppose the source file is named as “input.txt” and destination file is named as “output.txt”.
- b) How does an append mode differ from a write mode ?
What are the common uses of rewind () and ftell () functions ?



- c) Find from the following table, the area bounded by the curve and the x -axis from $x = 7.47$ to $x = 7.52$.

x	7.47	7.48	7.49	7.50	7.51	7.52
$f(x)$	1.93	1.95	1.98	2.01	2.03	2.06

8 + 3 + 4

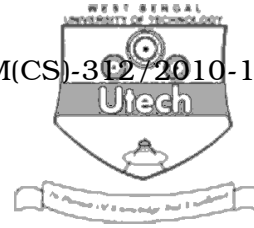
9. a) Write a program in C using recursive function to calculate the sum of all digits of any number.
- b) Write a C program to integrate $\int (4x - 3x^2) dx$, where lower and upper limits are 0 and 1 respectively, taking $h = 0.25$.

7 + 8

10. a) Use the fourth order Runge-Kutta method to find the value of y when $x = 0.2$ given that $y = 0$ when $x = 0$ and $dy/dx = 1 + y^2$.
- b) Apply Lagrange's interpolation formula to find $f(x)$ if $f(1) = 2, f(2) = 4, f(3) = 8, f(4) = 16$ and $f(7) = 128$.

- c) Write a C program to solve the equation $x^3 - 3x - 5 = 0$ within $(1, 2)$ by bisection method correct to 3 decimal places.

5 + 5 + 5



11. a) Solve the given system of equations :

$$10x + 2y + z = 9$$

$$2x + 20y - 2z = -44$$

$$-2x + 3y + 10z = 22$$

by Gauss-Seidel method.

b) Using Taylor's method, obtain an approximate value of y at $x = 0.2$ for the differential equation

$$\frac{dy}{dx} = 2y + 3e^x, y(0) = 0.$$

8 + 7

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