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# 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.	Cho	ose	the	correct	alternati	ves	for	any	ten	of	the
	follo	wing	<b>;</b> :						10	0 × 1 =	= 10
	i)	The	ratio	of absol	ute error	of the	e tru	e valu	ie is (	called	
		a)	rela	ative erro	r	b)	ab	solute	e erro	r	
		c)	trui	ncation e	rror	d)	inl	neren	t erro	r.	
	ii)	The	sign	ificant di	git of 0·00	00123	34 is				
		a)	7			b)	4				
		c)	8			d)	6.				
	iii)	The	perc	entage e	rror in ap	proxir	mati	ng 4/	3 to	1.333	3 is
		a)	0.0	025%		b)	25	%			
		c)	0.0	0025%		d)	0.2	25%			

[ Turn over

3102



- Given a pointer, ptr to a structure stru containing a iv) member name. Which of the following references name?
  - a) ptr → stru → name
- b) ptr.name
- ptr → stru.name c)
- d) ptr.str.name
- With every use of a memory allocation function, what v) function should be used to release allocated memory which is no longer needed?
  - unalloc() a)
- b) free()
- c) dealloc()
- d) dropmem().
- Which operator cannot be overloaded? vi)
  - a) cout

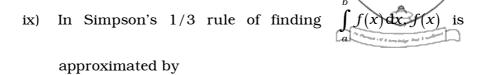
b) cin

c) ++

- d) ::
- vii) Which one of the following will read a character from the keyboard and will store in the variable c?
  - c=getc(); a)
- b) getc(&c);
- c) getchar(&c);
- c=getchar(); d)
- viii) If the interval of differencing in unity and  $f(x) = ax^2$ ( a is constant ), which one of the following choices is wrong?
- $\Delta f(x) = a(2x+1)$  b)  $\Delta^2 f(x) = 2a$ 

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





- 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)  $\frac{1}{a^2} \frac{1}{b^2}$

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#### (Short Answer Type Questions)

Answer any three of the following.



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° 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.

$$\int_{1}^{3} \frac{1}{x} \, \mathrm{d}x$$

- 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:

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

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

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





#### (Long Answer Type Questions)

Answer any three of the following.



- 7. a) Write a C program to multiply two matrices of order  $3 \times 3$  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 :

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

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

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

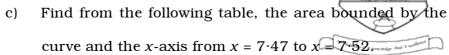
7 + 8

- 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?

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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.
- 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

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# 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  $\frac{\mathrm{d}y}{\mathrm{d}x}=2y+3e^x, y(0)=0.$  8+7