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BME-009

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B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) / BTCLEVI / BTMEVI / BTELVI / BTCSVI / BTECVI

Term-End Examination

June, 2014

BME-009 : COMPUTER PROGRAMMING AND APPLICATIONS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **four** questions from Part A. Attempt any **one** question from Part B. All questions carry equal marks. Use of scientific calculator is permitted.*

PART A

1. (a) Find the cubic polynomial which takes the following values :

$y(0) = 1, y(1) = 0, y(2) = 1$ and $y(3) = 10$

Hence, obtain y(4). 7

(b) Use Stirling's formula to find y(32) when the values of x and y(x) are given by the following table : 7

x :	20	25	30	35	40	45
y(x) :	14·035	13·674	13·257	12·734	12·089	11·309

2. (a) Use Lagrange's interpolation formula to find the value of f(x) when x = 0, from the following table : 7

x :	3	2	1	– 1
f(x) :	3	12	15	– 21

(b) Find the first and second derivatives of f(x) at x = 1·1 from the following tabulated values using Newton's forward difference : 7

x :	1·0	1·2	1·4	1·6	1·8	2·0
f(x) :	0·0000	0·1280	0·5440	1·2960	2·4320	4·0000

3. (a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using Simpson's 1/3 rule by taking h = 1/4. Hence compute an approximate value of the integral in each case. 7

(b) $y'' + xy' + y = 0$, $y(0) = 1$, $y'(0) = 0$. Obtain y when x = 0·1 and x = 0·2, using Taylor series method. 7

4. (a) Using bisection method, find an approximation root of the equation $x^3 - x - 4 = 0$ in the interval]1, 2[to two decimal places. 7

(b) Find an approximate value of $\sqrt{2}$ using the Newton – Raphson formula. 7

5. (a) Perform three iterations of the Jacobi method for solving the system of equations given as

$$\begin{bmatrix} 5 & 2 & 2 \\ 2 & 5 & 3 \\ 2 & 1 & 5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ -6 \\ -4 \end{bmatrix}$$

with $x^{(0)} = 0$. Exact solution is $x(1 - 1 - 1)^T$. 7

(b) Find the inverse of the matrix

$$A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & -1 & -1 \\ 1 & -2 & 1 \end{bmatrix}$$

using the LU decomposition method. 7

6. (a) Solve the system of equations

$$3x_1 + 5x_2 = 8$$

$$-x_1 + 2x_2 - x_3 = 0$$

$$3x_1 - 6x_2 + 4x_3 = 1$$

using Cramer's rule. 7

(b) Find by Horner's method, the root of the equation $x^3 + x^2 + x - 100 = 0$. 7

PART B

7. (a) Write a C++ program which finds the maximum number and its position in a list of N numbers. *8*

   (b) Explain the following with examples :

   (i) Polymorphism *3*

   (ii) Virtual Functions *3*

8. (a) Write a C++ program which determines the least of four numbers A, B, C and D with the help of a function small( ). *8*

   (b) Explain the following with examples :

   (i) Inline functions *3*

   (ii) Operator overloading *3*