No. of Printed Pages : 4

BME-009

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

BTCLEVI/BTMEVI/BTELVI/BTCSVI/BTECVI

Term-End Examination

00932

December, 2017

BME-009 : COMPUTER PROGRAMMING AND APPLICATIONS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted. Assume missing data, if any.*

1. (a) Obtain an approximate root for the following equation, rounded off to three decimal places, using Regula-Falsi method : 7

$$x \sin x - 1 = 0$$

(b) Find a root of $x^3 - 2x - 5 = 0$ using bisection method, where the root lies between 2 and 3. 7

2. (a) Solve the system of equations

$$x_1 + 2x_2 - 3x_3 + x_4 = -5$$

$$x_2 + 3x_3 + x_4 = 6$$

$$2x_1 + 3x_2 + x_3 + x_4 = 4$$

$$x_1 + x_3 + x_4 = 1$$

using Cramer's rule. 7

(b) Using the Gauss elimination method, show that the system of equations

$$\begin{bmatrix} 3 & 2 & -1 & -4 \\ 1 & -1 & 3 & -1 \\ 2 & 1 & -3 & 0 \\ 0 & -1 & 8 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 10 \\ -4 \\ 16 \\ 3 \end{bmatrix}$$

is inconsistent. 7

3. (a) From the following table, estimate the number of persons earning wages between 60 and 70 rupees : 7

Wages (in rupees)	*No. of Persons (in thousands)*
Below 40	250
40 – 60	120
60 – 80	100
80 – 100	70
100 – 120	50

(b) Using Bessel's formula, find the value of f(5) when the values of x and f(x) are given by the following table : 7

x :	0	4	8	12
f(x) :	143	158	177	199

4. (a) Use Lagrange's formula inversely to obtain the value of x corresponding to $y(x) = 85$ for the values given as : $y(2) = 94{\cdot}8$; $y(5) = 87{\cdot}9$; $y(8) = 81{\cdot}3$; $y(14) = 68{\cdot}7$. 7

(b) Compute the value of the integral

$$\int_{0{\cdot}2}^{1{\cdot}4} (e^x + \sin x - \log x)\, dx$$

by Trapezoidal rule. 7

5. (a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using Simpson's $\frac{3}{8}$ rule by taking $h = \frac{1}{6}$. 7

(b) Solve the differential equation $\frac{dy}{dx} = -xy^2$, $y = 2$ at $x = 0$, by Euler's modified method and obtain y at $x = 0{\cdot}1$ and $x = 0{\cdot}2$. 7

6. (a) Solve the following initial value problem using Runge-Kutta method of order two :

$$10y' = x^2 + y^2, \; y(0) = 1$$

Find $y(0{\cdot}2)$ taking $h = 0{\cdot}1$. *6*

(b) Write a C++ program to calculate and print the roots of a quadratic equation $ax^2 + bx + c = 0$. *8*

7. (a) Explain the following with examples : *9*

(i) Polymorphism

(ii) Inheritance

(iii) Friend Function

(b) Write a C++ program to evaluate the values of sin x given by

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots$$ *5*