# BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)
# BTCLEVI/BTMEVI/BTECVI/BTELVI/BTCSVI

## Term-End Examination

## December, 2013

## BME-009 : COMPUTER PROGRAMMING AND APPLICATION

*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 a root of the equation $\cos x = 3x - 1$ correct to three decimal places, using iteration method. 7

(b) Using Muller's method, find a root of the equation $y(x) = x^3 - 3x - 5 = 0$ which lies between 2 and 3. 7

**2.** (a) Solve the following system of equations. 7

$3x_1 + x_2 + 2x_3 = 3$

$2x_1 - 3x_2 - x_3 = -3$

$x_1 + 2x_2 + x_3 = 4$

Using Cramer's rule

(b) Find the inverse of the matrix. 7

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & 1/2 & 1 \end{bmatrix}$$

Using the Gauss - Jordan method.

3. (a) Determine the Eigen values and the corresponding eigen vectors of the following matrices. 7

$$A = \begin{bmatrix} 2 & -1 & -1 \\ 3 & -2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

(b) Let $f(x) = (x-2)^4 = 0$. Starting with the initial approximation $x_0 = 2.1$, compute the iterations $x_1$, $x_2$, $x_3$ and $x_4$ using Newton - Raphson method. 7

4. (a) A third degree polynomial passes through the points (0, −1), (1, 1), (2, 1) and (3, −2). Find the polynomial and evaluate the y - coordinate at $x = 4$ using Newton's interpolation. 7

(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 |

5. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$, using Trapezoidal rule, with six subintervals. 7

(b) Using Lagrange's interpolation, find the value of $x$ when $y = 3$ from the following table : 7

| | | | | | |
|---|---|---|---|---|---|
| $x$ | : | 4 | 7 | 10 | 12 |
| $y$ | : | $-1$ | 1 | 2 | 4 |

6. (a) Given $y' = -xy^2$, $y(2) = 1$. Find $y(2.1)$ and $y(2.2)$ with $h = 0.1$ using Runge - Kutta method of order two. 7

(b) Solve by Taylor series method 7

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

## PART-B

7. (a) Write a C++ program that reads total marks of 20 students in a class. Find out number of students who have obtained total marks below class average. 7

(b) Explain the following with examples :

(i) Static and dynamic binding 4

(ii) Encapsulation 3

8. (a) Write a C++ program, which generates factorial of a number using function fact ( ). 8

(b) Explain the following with examples. 6

(i) Friend function

(ii) Polymorphism