

**B.Tech. MECHANICAL ENGINEERING
(COMPUTER INTEGRATED MANUFACTURING)**

BTCLEVI/BTMEVI/BTELVI/BTCSVI/BTECVI

Term-End Examination

December, 2016

**BME-009 : COMPUTER PROGRAMMING
AND APPLICATIONS**

Time : 3 hours

Maximum Marks : 70

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

1. (a) Apply Lagrange's formula to find the form of the function, given 7

x:	0	1	2	3	4
f(x):	3	6	11	18	27

- (b) Use Stirling's formula to find $y(32.1)$ for the following data : 7

x:	20	30	40	50
y(x):	512	439	346	243

2. (a) Find the sum of the series

$$\frac{1}{51^2} + \frac{1}{53^2} + \dots + \frac{1}{99^2}$$

using Euler-Maclaurin summation formula. 7

- (b) Apply Simpson's $\frac{1}{3}$ rd rule to evaluate

$$\int_0^2 \frac{dx}{1+x^3}$$
 to two decimal places by dividing

the range into 4 equal parts. 7

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

$$y' = \frac{y-x}{y+x}, \quad y(0) = 1$$

Find $y(0.5)$ taking $h = 0.5$. 7

- (b) Using Taylor series method, obtain the value of y at $x = 0.2$, if y satisfies the equation $y'' = xy'^2 - y^2$ given that when $x = 0$; $y = 1$ and $y' = 0$. 7

4. (a) Use the LU decomposition method to solve the following system of equations : 7

$$x_1 + x_2 + x_3 = 1$$

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

$$3x_1 + 5x_2 + 3x_3 = 4$$

- (b) Determine the eigenvalues and the corresponding eigenvectors for the matrix

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}. \quad 7$$

5. (a) Find an approximate value of $\sqrt{2}$ using the Newton-Raphson formula. 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

6. (a) Write a C++ program which calculates multiplication of two matrices. 6

- (b) Explain the following with examples : 8

- (i) Encapsulation
- (ii) Virtual functions

7. (a) Write a C++ program which computes the sum of the squares of the first N natural numbers. 5

- (b) Explain the following : 9

- (i) Scope of Variables
- (ii) Constructor and Destructor
- (iii) Dynamic Binding