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**BME-009**

# B.Tech. MECHANICAL ENGINEERING
## (COMPUTER INTEGRATED MANUFACTURING)
## BTCLEVI/BTMEVI/BTELVI/BTCSVI/BTECVI
### Term-End Examination

00023 **June, 2018**

## 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) Find the root of the equation

$$x^3 - x - 1 = 0$$

by Muller's method. 7

(b) In the bending of an elastic beam the normal stress y at distance x from the middle section is given by the following table :

| x | 0·0 | 0·25 | 0·50 | 0·75 | 1·00 |
|---|---|---|---|---|---|
| y | 0·46 | 0·39 | 0·25 | 0·12 | 0·04 |

Use Newton's forward interpolation formula to deduce the value of y where x = 0·04. 7

**2.** (a) The value of x and y are given as below :

| x | 5 | 6 | 9 | 11 |
|---|---|---|---|---|
| y | 12 | 13 | 14 | 16 |

Find the value of y when x = 0. Use Lagrange's Interpolation Formula. 7

(b) Given the table values

| x | 50 | 52 | 54 | 56 |
|---|---|---|---|---|
| $\sqrt[3]{x}$ | 3·684 | 3·732 | 3·779 | 3·865 |

use Lagrange's formula to find

x when $\sqrt[3]{x} = 3{\cdot}756$. 7

**3.** (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) Using Lin – Bairstow's method obtain the quadratic factors of the following equation : 7

$$x^3 - 2x^2 + x - 2$$

**4.** (a) Find the inverse of the matrix

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

using the Gauss-Jordan Method. 7

(b) Using Runge-Kutta method by order of four,

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

Find $y(0{\cdot}5)$ using $h = 0{\cdot}5$. 7

**5.** (a) Perform four iterations of the Jacobi method for solving the system of equations

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

with $x^{(0)} = 0$. 7

(b) Evaluate $\int_0^1 \frac{dx}{1 + x^2}$, using Simpson's $\frac{1}{3}$ rule by taking $h = \frac{1}{4}$. 7

**6.** (a) Write a C++ program to calculate and print the roots of a quadratic equation

$$ax^2 + bx + c = 0.$$ 7

(b) Write a C++ program that reads a temperature in Celsius degrees and prints the equivalent in Fahrenheit degrees. 7

Formula $\frac{C}{5} = \frac{F - 32}{9}$

7. (a) (i) What is glass class and local class ? 2

(ii) What is null object ? 2

(iii) Explain the difference between the following two declarations : 2

int n1 = n;

int and n2 = n;

(iv) Write an equivalent statement 1

$i^{++}$.

(b) Write a C++ program to calculate the volume of a square pyramid given by the formula

Volume = 1/3 $a^2h$

where 'a' is the side of the square,

'h' is the height of the pyramid. 7

8. (a) (i) What is a nested loop ? Give an example. 2

(ii) What is the difference between a class and struct ? 2

(iii) What is wrong in the following code ?

char c = 'h';

char p = &c; 2

(iv) How can we access the memory address of a variable ? 1

(b) Write a C++ program that reads the user's age and then prints. "you are a child", if the age < 18, "you are an adult" if 18 ≤ age < 65, and "you are a senior citizen" if age ≥ 65. 7