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BME-009

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

BTCLEVI/BTMEVI/BTELVI/BTCSVI/BTECVI

Term-End Examination

00333

December, 2018

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.*

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1. (a) Find the root of the equation

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

by Muller's method. 7

(b) Find the roots of equation

$$x^3 - 4x - 9 = 0$$

by bisection method, correct to three decimal places. 7

2. (a) Using Gauss' forward formula, find the value of f(32). 7

Given that :

$f(25) = 0{\cdot}2707,\ f(30) = 0{\cdot}3027$

$f(35) = 0{\cdot}3386,\ f(40) = 0{\cdot}3794$

(b) Solve the given initial value problems :

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

Find y(0·5)

taking h = 0·5

by using Runge-Kutta method of order four. 7

3. (a) Given the table of 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

(b) Starting with $x_0 = 0$ find an approximate root of the equation $x^3 - 4x + 1 = 0$, rounded off to five decimal places using Newton – Raphson method. 7

4. (a) Compute roots of the equation

$e^x = x^2$ to an accuracy of 10^5 using an iterative method. 7

(b) Find the inverse of 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

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

(b) Evaluate $\int_0^1 \frac{dx}{1 + x^2}$, using

(i) Simpson's $\frac{1}{3}$ rule by taking $h = \frac{1}{4}$

(ii) Simpson's $\frac{3}{8}$ rule by taking $h = \frac{1}{6}$.

Hence compute the approximate value of x in each case. 7

6. (a) Write a C^{++} program to print sum and count of non-negative numbers out of a list of 150 numbers. 7

(b) Write a C^{++} program to calculate and print the roots of a quadratic equation

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

7. (a) Write a C^{++} program to calculate minimum, maximum and average values of a given set of 'n' numbers. *7*

(b) (i) Find out errors, if any, in the following code : *2*

if x < y min = x

else min = y

(ii) Explain the difference between template class and class template. *2*

(iii) What is a nested loop ? Give an example. *2*

(iv) What is a null object ? *1*

8. (a) Write a C^{++} program to calculate and print factorial of an integer. *7*

(b) (i) Write the format and syntax of switch statement. *2*

(ii) What is dynamic binding ? Differentiate it from static binding. *2*

(iii) What is overloading in context of C^{++} ? *2*

(iv) List the base file input/output operators in C^{++}. *1*