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BME-009(S)

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

BTCLEVI/BTMEVI/BTELVI/BTCSVI/BTECVI

Term-End Examination

00438

December, 2016

BME-009(S) : 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 real root of the equation

$$x^4 + x^2 - 80 = 0$$

using Newton-Raphson method, correct to three decimal places. 7

(b) Find the real root of the equation

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

using Muller's method. 7

2. (a) Use Stirling's formula to find U_{32} from the following table : 7

U_{20}	14·035	U_{25}	13·674	U_{30}	13·257
U_{35}	12·734	U_{40}	12·089	U_{45}	11·309

(b) Using Gauss' forward formula, find the value of f(32). Given that 7

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

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

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

$$x^3 - 2x^2 + x - 2 = 0$$

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) Solve the given initial value problem

$$Y' = \frac{Y - X}{Y + X}, \quad Y(0) = 1$$

Find Y(0·5)

taking h = 0·5

by using Runge-Kutta method of order four. 7

5. (a) Find the inverse of the matrix

$$A = \begin{bmatrix} 5 & 8 & 2 \\ 0 & 2 & 1 \\ 4 & 3 & -1 \end{bmatrix}$$

using LU decomposition method. 7

(b) 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

6. (a) Write a C++ program that prints the following numbers in descending order : 7

1 2 4 8 16 32 64 128

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

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

7. (a) Write a C++ program which reads the values of A, B and C and computes the semi-perimeter and area of the triangle using the formula

$$S = (A + B + C) / 2$$

$$\text{Area} = \sqrt{S(S - A)(S - B)(S - C)}$$

Also print A, B, C on one line and area on the next line. 7

(b) (i) Explain the difference between template class and class template. 2

(ii) How can you access the memory address of a variable ? 2

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

(iv) What is null object ? 1

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

$$\text{volume} = \frac{1}{3} a^2 h,$$

where 'a' is the side of the square and 'h' is the height of the pyramid. 7

(b) (i) What is a derived data type ? Give an example. 2

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

(iii) What is wrong in the following code ? 2

```
char c = 'h';
char p = & c;
```

(iv) What is a 'fall-through' ? 1