

**BACHELOR OF TECHNOLOGY IN
MECHANICAL ENGINEERING
(COMPUTER INTEGRATED
MANUFACTURING)**

Term-End Examination

June, 2008

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

Time : 3 hours

Maximum Marks : 70

Note : Answer any *five* of the following questions. Use of calculator is allowed.

1. (a) Solve the following system of equations using LU decomposition :

$$x_1 + 2x_2 + x_3 = 1$$

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

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

The values be computed upto four places of decimal.

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- (b) Solve the following system of equations using Gauss elimination :

$$2x + y + z = 8$$

$$3x + 3y + 4z = 20$$

$$2x + y + 3z = 13$$

Using partial pivoting, the values be computed upto four places of decimal.

2. (a) Find an approximate root of the cubic equation

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

using Secant method starting with $a = 1$, $b = 2$ rounded off to three decimal places.

- (b) Find the smallest positive root of the following equation by Regula - Falsi method correct to 5 decimal places :

$$2x - \tan x = 0.$$

3. (a) The following table gives x and corresponding values of $f(x)$. Using Lagrange's interpolation formula find the form of the function $f(x)$. Using $f(x)$, compute $f(3.5)$.

$x :$	0	1	2	3	4
$f(x) :$	3	6	10	17	25

- (b) Perform 4 iterations of the Jacobi method for solving the following system of equations with $x^{(0)} = 0$, the exact solution is $x = [-1 \ -4 \ -3]^T$.

$$\begin{bmatrix} -8 & 1 & 1 \\ 1 & -5 & 1 \\ 1 & 1 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 16 \\ 7 \end{bmatrix}$$

4. Prove that when a table is constructed from $y = f(x)$ and if $f(x)$ is an n^{th} degree polynomial in x , then the n^{th} divided differences are constant.

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5. (a) What is the effect of execution of the following statements :

```
#include < iostream.h >
```

```
#include < stdio.h >
```

- (b) Find out error(s), if any, in the following code :

```
if x < y min = x
```

```
else min = y
```

- (c) Write an equivalent statement for the statement :

```
i++
```

- (d) What is wrong with the following code ?

```
char c = 'w';
```

```
char p = &c;
```

- (e) What does the following statement do ?

```
enum Direction {North, South, East, West};
```

- (f) In context of C++, explain what is operator overloading.

- (g) What is the difference between a template class and a class template ?

7×2=14

6. (a) What is the difference between a pointer and an array ?

- (b) Differentiate between an object and a class.

- (c) Distinguish a struct from a class.
- (d) What is a nested loop ? Give an example.
- (e) Differentiate between global class and local class.
- (f) What is dynamic binding ? Differentiate it from static binding.
- (g) What is a derived data type ? Give an example.

7×2=14

7. (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 base, 'h' is the height of the pyramid.

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- (b) What different types of data are used in C++ ? If applicable, how can we convert one type to other ? 3
 - (c) Discuss the basic file input/output operations in C++. 3
 - (d) Describe what is a preprocessor. 1
8. (a) Write a program to find the product of n given natural numbers, where the natural numbers and the number n are given as input by the user. 7
- (b) Write a program to calculate minimum, maximum and average values of a given set of n numbers. 7