BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

02541

Term-End Examination

December, 2010

BME-009 : COMPUTER PROGRAMMING AND APPLICATION

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any five questions. All questions carry equal marks. Use of calculator is permitted.*

1. (a) Prove the following relations : 7+7

   (i) $\Delta\left(\dfrac{1}{f_i}\right) = -\dfrac{\Delta f_i}{f_i\, f_{i+1}}$

   (ii) $\Delta\left(f_i^2\right) = \left(f_i + f_{i+1}\right)\Delta f_i$

   (b) For the data :

x	-4	-2	0	2	4	6
f(x)	-139	-21	1	23	141	451

   Construct the forward and backward difference table. Using the corresponding interpolation, Compute the value of $f(1)$ and $f(3)$.

2. (a) Find the Lagrange Interpolating polynomial 7+7
that fits the following data values.

x	1	2	4
f(x)	1	7	61

Determine the approximate value of $f(3)$.

(b) Perform three iteration of the Newton–
Raphson method to find a root of the
equation

$xe^x - 1 = 0$

Which is close to O.S.

3. (a) The equation $f(x) = lnx - x + 3 = 0$, has a 7+7
root in the interval (4, 5). Obtain the root
correct to three decimal places using
Regula-falsi method with $x_0 = 4$, $x_1 = 5$.

(b) Solve the following system of equations with
the help of Gauss Elimination method :

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

$x - y + 2z = 3$

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

4. (a) Find the root of the equation 7+7

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

Using the bisection method in four stages.

(b) Solve the following equations with the help of Jocobi's iteration method.

$20x + y - 2z = 17$

$3x + 20y - z = -18$

$2x - 3y + 20z = 25$

5. (a) Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ by using   7+7

(i) Simpson's $\frac{1}{3}$ rule, and

(ii) Simpson's $\frac{3}{8}$ rule.

(b) Apply Runge-Kutta fourth order method, to find approximate value of y when $x = 0.2$ given that $\frac{dy}{dx} = x + y$, and $y = 1$ when $x = 0$.

6. (a) Write a C++ programme that gives the   7+7 option of converting Fahrenheit to Celsius or Celcius to Fahrenheit.

(b) Write a C++ programme to calculate area of a circle, a rectangle or a triangle depending upon a user's choice.

7. (a) Write a C++ programme to calculate the   7+7 values of the function

$$f(x) = \frac{x^2 + 1 \cdot 5x + 5}{x - 3}$$

for $x = -10$ to 10, x should take values $-10, -8, -6, \ldots\ldots 6, 8, 10$.

(b) (i) What will be the output produced by following code ?

```
for (i = 10; i< = 50; i+ = 10)
{
    j= i/2;
    cout << j<< " ";
}
```

(ii) What will be the output produced by following code fragment ?

```
for (i= 10; i< = 50; i+ = 8)
    j= i/2;
    cout << j<< " ";
```

8. (a) Given three numbers A, B, and C, write a 7+7 C++ program to write their values in descending order.

(b) Write a C++ program to

(i) Find the radius of a circle whose area is given

(ii) Calculate the volume and surface area of a sphere.

[Given Volume = $\frac{4}{3}\pi r^3$ and Surface Area = $4\pi r^2$]

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