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BME-009

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

03284

Term-End Examination

June, 2011

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=14**

(i) $$\Delta\left(\frac{fi}{gi}\right) = \frac{g_i \Delta f_i - f_i \Delta g_i}{g_i \, g_{i+1}}$$

(ii) $$\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}.$$

(b) Compute an approximation value of f (1.35) and f (1.25) by using Newton's backward difference formula for the given data :

x	1	1.1	1.2	1.3	1.4
$f(x)$	7.0	8.093	9.384	10.891	12.632

2. (a) Find the Lagrange interpolating polynomial that fits the following data values. **7+7=14**

x	-1	2	3	4
$f(x)$	-1	11	31	69

Also determine the approximate value of $f(1.5)$.

(b) Using Newton - Raphson method obtain a root of the equation.

$$x^3 - 5x + 1 = 0,$$

correct to three decimal places.

Assume $x_0 = 0.0$

3. (a) Solve the following system of equations with the help of Gauss-Elimination method. **7+7=14**

$x + y + z = 7$

$x + 2y + 3z = 16$

$x + 3y + 4z = 22$

(b) Find a real root of the equation

$$x \log_{10} x = 1.2$$

by Regula-falsi method correct to four decimal places.

4. (a) Find a real root of the equation **7+7=14**

$$x^4 - x - 10 = 0$$

by using Bisection method correct to three decimal places.

(b) Solve the following equations with the help of Gauss - Seidel iteration method.

$20x + y - 2z = 17$

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

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

5. (a) The velocity v(km/min) of a moped which starts from rest, is given at fixed intervals of time t (min) as follows : **7+7=14**

t :	2	4	6	8	10	12	14	16	18	20
v :	10	18	25	29	32	20	11	5	2	0

Estimate approximately the distance covered in 20 minutes using Simpson's rule.

(b) Use Runge-Kutta method to find y when $x=1.2$ in steps of 0.1, given that :

$$\frac{dy}{dx} = x^2 + y^2 \text{ and } y(1) = 1.5$$

6. (a) Write a C++ programme to calculate and print the roots of a quadratic equation **7+7=14**

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

(b) Write a C++ programme to calculate and print the factorial of an integer.

7. (a) What are the output of the following two codes fragment in C++ ? Justify your answer. **7+7=14**

```
// version 1                    // version 2
int f=1, i=2 ;                  int f=1, i=2 ;
while (++i<5)                   do {
                                        f * = i;
f * = i ;                       } while (++i<5);
cout < < f ;                    cout < < f ;
      :                               :
```

(b) Write a C++ program that prints the following numbers in descending order.
1 2 4 8 16 32 64 128

8. (a) Write a C++ program to compute cosine series i.e, **7+7=14**

$$\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + ... + \frac{x^n}{n!}$$

(b) Write a C++ program to find out whether a year (entered in 4-digit number representing it) is a leap year.