gate 1

EE24Btech11041 - Mohit

Q.7-Q.24 carry two marks each

1) The minimum number of terms required in the series expansion of e^x to evaluate at $x = 1$ correct up to 3 places of decimals is   (XE 2007)

   a) 8   b) 7   c) 6   d) 5

2) The iteration scheme $x_{n+1} = \frac{1}{1+x_n^2}$ converges to a real number x in the interval $(0, 1)$ with $x_0 = 0.5$. The value of x correct up to 2 places of decimal is equal to   (XE 2007)

   a) 0.65   b) 0.68   c) 0.73   d) 0.80

3) If the diagonal elements of a lower triangular square matrix A are all different from zero, then the matrix A will always be   (XE 2007)

   a) symmetric   b) non-symmetric   c) singular   d) non-singular

4) If two eigenvalues of the matrix
$$M = \begin{pmatrix} 2 & 6 & 0 \\ 1 & p & 0 \\ 0 & 0 & 3 \end{pmatrix}$$
   are -1 and 4, then the value of p is: (XE 2007)

   a) 4   b) 2   c) 1   d) -1

5) Consider the system of linear simultaneous equations:
$$x + 10y = 5; \quad y + 5z = 1; \quad 10x - y + z = 0$$
   On applying Gauss-Seidel method, the value of x correct up to 4 decimal places is: (XE 2007)

   a) 0.0385   b) 0.0395   c) 0.0405   d) 0.0410

6) The graph of a function $y = f(x)$ passes through the points $(0, -3), (1, -1), (2, 3)$. Using Lagrange interpolation, the value of x at which the curve crosses the x-axis is obtained as: (XE 2007)

   a) 1.375   b) 0.0395   c) 0.0405   d) 0.0410

7) The equation of the straight line of best fit using the following data: by the principle of least squares

x	1	2	3	4	5
y	14	13	9	5	2

   is: (XE 2007)

   a) $y = 18 - 3x$ b) $y = 18.1 - 3.1x$ c) $y = 18.2 - 3.2x$ d) $y = 18.3 - 3.3x$

8) On solving the initial value problem:
$$\frac{dy}{dx} = xy^2, \quad y(1) = 1 \tag{1}$$
   by Euler's method, the value of y at $x = 1.2$ with $h = 0.1$ is:

   (XE 2007)

a) 1.1000 b) 1.1232 c) 1.2210 d) 1.2331

9) The local error of the following scheme:

$$y_{n+1} = y_n + \frac{h}{12}\left(5y'_{n+1} + 8y'_n - y'_{n-1}\right) \tag{2}$$

by comparing with the Taylor series:

$$y_{n+1} = y_n + hy'_n + \frac{h^2}{2!}y''_n + \cdots \tag{3}$$

is: (XE 2007)

a) $O(h^4)$ b) $O(h^5)$ c) $O(h^2)$ d) $O(h^3)$

10) The area bounded by the curve $y = 1 - x^2$ and the x-axis from $x = -1$ to $x = 1$ using Trapezoidal rule with step length $h = 0.5$ is: (XE 2007)

a) 1.20 b) 1.23 c) 1.25 d) 1.33

11) The iteration scheme:

$$x_{n+1} = \sqrt{a}\left(1 + \frac{3a^2}{x_n^2}\right) - \frac{3a^2}{x_n}, a > 0 \tag{4}$$

converges to the real number: (XE 2007)

a) $\sqrt{a}$ b) a c) $a\sqrt{a}$ d) a^2

12) If the binary representation of two numbers m and n are 01001101 and 00101011, respectively, then the binary representation of $m - n$ is: (XE 2007)

a) 00010010 b) 00100010 c) 00111101 d) 00100001

13) Which of the following statements are true in a C program?
P: A local variable is used only within the block where it is defined, and its sub-blocks
Q: Global variables are declared outside the scope of all blocks
R: Extern variables are used by linkers for sharing between other compilation units
S: By default, all global variables are extern variables (XE 2007)

a) P and Q b) P, Q and R c) P, Q and S d) P, Q, R and S

4

14) Consider the following recursive function g().

```
1  Recursive integer function g(m,n) result (r)
2  integer :: m,n
3  if (n == 0) then
4      r=m
5  else if (m <= 0) then
6      r = n + 1
7  else if ( (n - n/2*2) == 1) then
8      r = g(m-2 , n/2)
9  end if
10 end
```

Which value will be returned if the function g is called with 6, 6 ? (XE 2007)

a) 2 b) 4 c) 6 d) 8

15) If the following function is called with x = 1

```
1  real function print_value(x)
2  real :: x , sum , term
3  integer :: i
4  i = 0
5  sum = 2.0
6  term = 1.0
7  do while (term > 0.00001)
8      term = x * term/(i+1)
9      sum = sum + term
10     i = i + 1
11 end do
12 print_value = sum
13 end
```

The value returned will be close to (XE 2007)

a) $\log_e 2$ b) $\log_e 3$ c) $1 + e$ d) e

16) Consider the following C program

```
1  #include <stdio.h>
2  #include <string.h>
3
4  void main()
5  {
6      char s[80], *p;
7      int sum = 0;
8      p = s;
9      gets(s);
10     while (*p)
11     {
12         if (*p == '1')
13             sum = 2*sum + 1;
14         else if (*p == '0')
15             sum = sum * 2;
16         else
17             printf("invalid string");
18         p++;
19     }
20     printf("%d", sum);
21 }
```

Which number will be printed if the input string is 10110? (XE 2007)

a) 31   b) 28   c) 25   d) 22

I. COMMON DATA QUESTIONS

Common Data for Questions 23,24: Consider the following C program segment

```c
#include <stdio.h>

void print_mat(int[][3]);

void main() {
    int i, j, sum = 0;
    int m[3][3] = {{1, 3, 5}, {7, 9, 11}, {13, 15, 17}};

    for (i = 0; i < 3; i++) {
        for (j = 2; j > 1; j--) {
            sum += m[i][j] * m[i][j - 1];
        }
    }

    printf("%d", sum);
    print_mat(m); // FUNCTION CALL
}

void print_mat(int mat[][3]) {
    int (*p)[3] = &mat[1];
    printf("%d and %d", (*p)[1], (*p)[2]);
}
```

17) The value of sum that will be printed by the program is

a) 369   b) 361   c) 303   d) 261