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

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

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

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:

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:

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:

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:

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:

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:

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:

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:

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:

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

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().

```
Recursive integer function g(m,n) result (r)
integer :: m,n
if (n == 0) then
    r=m
else if (m <= 0) then
    r = n + 1
else if ( (n - n/2*2) == 1) then
    r = g(m-2 , n/2)
end if
end
```

Which value will be returned if the function g is called with 6, 6 ?

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

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

```
real function print_value(x)
real :: x , sum , term
integer :: i
i = 0
sum = 2.0
term = 1.0
do while (term > 0.00001)
   term = x * term/(i+1)
   sum = sum + term
   i = i + 1
end do
print_value = sum
end
```

The value returned will be close to

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

16) Consider the following C program

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

void main()
{
   char s[80], *p;
   int sum = 0;
   p = s;
   gets(s);
   while (*p)
   {
      if (*p == ’1’)
         sum = 2*sum + 1;
      else if (*p == ’0’)
         sum = sum * 2;
      else
         printf("invalid string");
      p++;
   }
   printf("%d", sum);
}
```

Which number will be printed if the input string is 10110?

a) 31　　b) 28　　c) 25　　d) 22