

(6 pages)

NOVEMBER 2012

P/ID 37459/PMAE

Time : Three hours

Maximum : 60 marks

SECTION A — (10 × 1 = 10 marks)

Answer ALL the questions.

Each question carries 1 mark.

1. Write down the content and purpose of the header file `<stdio.h>`.
2. Write down the general format for creating a reference variable.
3. List out the operators that can not be over loaded by using friend functions.
4. What are the two types of polymorphism?
5. Define asymptotic error constant.
6. Define ill-conditioned system of linear equations $AX = B$.
7. Write down the Taylor's polynomial approximation for a function $f(x) \in C^{N+1}[a, b]$.

8. Find the value of h , that minimizes

$$f(h) = \frac{\epsilon}{h} + \frac{mh^2}{6}.$$

9. State the recursive Simpson Rule.
10. Define the sequence of Trapezoidal rules.

SECTION B — (5 × 3 = 15 marks)

Answer ALL the questions.

Each question carries 3 marks.

11. (a) Briefly discuss the software evolution during 1950-1990.

Or

- (b) Describe enumerated data type with example.

12. (a) Write down different prototypes for declaring operator functions.

Or

- (b) How are the operators $>>$ and $<<$ overloaded? Give example.

13. (a) A sum of ₹ 250 is deposited per month for 20 years. If the sum assured is ₹ 2,50,000 at the end of the period, determine the rate of interest, given by the finance company.

Or

- (b) Find the Jacobian matrix of order 3×3 at $(1, 3, 2)$ for $f_1 = x^3 - y^2 + y - z^4 + z^3$;
 $f_2 = xy + yz + xz$; $f_3 = \frac{y}{xz}$.

14. (a) Let $f(x) = (1+x)^p$ and $x_0 = 0$. Show that the Taylor polynomial of degree N is

$$P_N(x) = 1 + px + \frac{p(p-1)x^2}{2!} + \dots + \frac{p(p-1)(p-2)\dots(p-N+1)x^N}{N!} .$$

Or

- (b) Given that $f(x) = \cos x$, using the central difference formula of $o(h^2)$, with $h = 0.01$, and 0.001 . Find approximations to $f''(0.8)$ (correct to nine decimal places).

15. (a) Determine the degree of precision of Simpson's $\frac{3}{8}$ rule.

Or

- (b) Suppose that ₹ 1000 is deposited and earns 10% interest compounded continuously over 5 years. Find the total amount at the end of 5 years, if the interest is compounded annually, monthly, and daily. (Assume that 360 working days in a year)

SECTION C — (5 × 7 = 35 marks)

Answer ALL the questions.

Each question carries 7 marks.

16. (a) Write a program to read a matrix of size $m \times n$ from the keyboard.

Or

- (b) What is a friend function? What are the merits and demerits of using friend functions?

17. (a) Describe multiple and multilevel inheritances.

Or

- (b) Explain ios format functions :
(i) Width ()
(ii) Precision () and
(iii) fill ().

4

P/ID 37459/PMAE

[P.T.O.]

18. (a) State and prove bisection theorem.

Or

- (b) Solve the following system by Gauss-Jacobi and Gauss-Seidal methods.

$$\begin{aligned}10x - 5y - 2z &= 3; & 4x - 10y + 3z &= -3 ; \\ x + 6y + 10z &= -3. \text{ (correct to three decimal} \\ & \text{places).}\end{aligned}$$

19. (a) Let the given graph be $y = f(x) = \cos x$ on $[0, 1.2]$.

- (i) Construct a linear interpolation polynomial $P_1(x)$, using the nodes $x_0 = 0.0$ and $x_1 = 1.2$.
- (ii) Construct a linear approximating polynomial $Q_1(x)$, using the nodes $x_0 = 0.2$, and $x_1 = 1.0$.

Or

- (b) State and derive the centered formula of order of $o(h^4)$.

20. (a) Find the minimum of the function $f(x) = x^2 - \sin(x)$ on $[0,1]$, using the Fibonacci search method. Use a tolerance of $\epsilon = 10^{-4}$ and the distinguishability constant $e = 0.01$.

Or

- (b) Determine the value $y(0.4)$, using Milne-Simpson method, given $y' = xy + y^2$, $y(0) = 1$. Use Taylor series to get the values of $y(0.1)$, $y(0.2)$ and $y(0.3)$.
-