Select the correct answer or fill up the blanks in the following questions:

1. If x is the true value of a quantity and $x1$ is its approximate value, then the relative error is

(a) $|x_1 - x|/x_1$ (b) $|x - x_1|/x$ (c) $|x_1/x|$ (d) $x/|x_1 - x|$.

2. The relative error in the number 834.12 correct to five significant figures is …

3. If a number is rounded to k decimal places, then the absolute error is

(a) $\frac{1}{2}10^{k-1}$ (b) $\frac{1}{2}10^{-k}$ (c) $\frac{1}{3}10^{k}$ (d) $\frac{1}{4}10^{-k}$.

4. If π is taken $= 3.14$ in place of 3.14156, then the relative error is

5. Given $x = 1.2$, $y = 25.6$, and $z = 4.5$, then the relative error in evaluating $w = x^2 + y/z$ is…

6. Round off values of 43.38256, 0.0326457, and 0.2537623 to four significant digits: …

7. Round relative maximum error in $3x2y/z$ when $dx = dy = dz = 0.001$ at $x = y = z = 1$: …

8. If both the digits of the number 8.6 are correct, then the relative error is…

9. If a number is correct to n significant digits, then the relative error is

(a) $\frac{1}{2}10^{n}$ (b) $\frac{1}{2}10^{n-1}$ (c) $\leq\frac{1}{2}10^{-n}$ (d) $<\frac{1}{2}10^{n-1}$.

10. If $(\sqrt{3}+\sqrt{5}+\sqrt{7})$ is rounded to four significant digits, then the absolute error is

11. $(\sqrt{102}-\sqrt{101})$ correct to three significant figures is…

12. Approximate values of 1/3 are given as 0.3, 0.3, and 0.34. Out of these the best approximation is …

13. The relative error if 2/3 is approximated to 0.667, is…

14. If the first significant digit of a number is p and the number is correct to n significant digits, then the relative error is …

Answer:

1. (*b*)	**2.** 0.000005.	**3.** (*b*).	**4.** 0.00049.
5. 0.007.	**6.** 43.38; 0.63264; 0.2538.	**7.** 0.004.	**8.** 0.0058
9. (*c*).	**10.** 0.0015.	**11.** 0.0496.	**12.** 0.33.
13. 0.0005.	**14.** $< 1\ (p \times 10^{n-1})$.		

MCQ on Newton-Raphson, Bisection Method, Regula -Falsi Method

Select the correct answer or fill up the blanks in the following questions:

1. The order of convergence in the Newton-Raphson method is
(*a*) (*b*) 3 (*c*) 0 (*d*) none.

2. The Newton-Raphson algorithm for finding the cube root of N is...........

3. The bisection method for finding the roots of an equation $f(x) = 0$ is..........

4. In theRegula-falsi method, the first approximation is given by.............

5. If $f(x) = 0$ is an algebraic equation, the Newton-Raphson method is given by $xn_{+1} = xn - f(xn)/?$
(*a*) $f(x_{n-1})$ (*b*) $f'(x_{n-1})$ (*c*) $f'(x_n)$ (*d*) $f''(x_n)$.

6. In the Regula-falsi method of finding the real root of an equation, the curve *AB* is replaced by......

7. Newton's iterative formula to find the value of $\sqrt{N}$ is..............

8. A root of $x^3 - x + 4 = 0$ obtained using the bisection method correct to two places, is........ .

9. Newton-Raphson formula converges when............ .

10. In the case of bisection method, the convergence is
(*a*) linear (*b*) quadratic (*c*) very slow.

11. Out of the method of false position and the Newton-Raphson method, the rate of convergence is faster for............ .

12. Using Newton's method, the root of $x^3 = 5x - 3$ between 0 and 1 correct to two decimal places, is........ .

13. The Newton-Raphson method fails when
(*a*) $f'(x)$ is negative (*b*) $f'(x)$ is too large
(*c*) $f'(x)$ is zero (*d*) Never fails.

14. The condition for the convergence of the iteration method for solving $x = \phi(x)$ is......

15. While finding a root of an equation by the Regula-falsi method, the number of iterations can be reduced......... .

16. Newton's method is useful when the graph of the function while crossing the x-axis is nearly vertical. (True or False)

17. The difference between a Transcendental equation and polynomial equation is......... .

18. The interval in which a real root of the equation $x^3 - 2x - 5 = 0$ lies is....... .

19. The iterative formula for finding the reciprocal of N is x_{n+1} =......... .

20. While finding the root of an equation by the method of false position, the number of iterations can be reduced...... .

Answer:

1. (a).

2. $x_{n+1} = \frac{1}{3}\left(2x_n + N / x_n^2\right)$.

3. $x_{n+1} = \frac{1}{2}\left(2x_n + x_{n-1}\right)$.

4. $x_2 = x_0 - \frac{x_1 - x_0}{f(x_1) - f(x_0)} f(x_0)$.

5. (c).

6. Chord AB.

7. $x_{n+1} = \frac{1}{2}(x_n + N / x_n)$.

8. 1.79.

9. Initial approximation is chosen sufficiently close to the root.

10. (c)

11. Newton-Raphson method.

12. 0.657.

13. (c).

14. $|\phi'(x)| < 1$.

15. If we start with a smaller interval for the root.

16. True

17. 2.1.

18. (2, 3)

19. $x_n (2 - Nx_n)$

20. If we start with a smaller interval for the root.

MCQ on Newton-Raphson, Bisection Method, Regula -Falsi Method

Select the correct answer or fill up the blanks in the following questions:

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(*a*) (*b*) 3 (*c*) 0 (*d*) none.

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4. In theRegula-falsi method, the first approximation is given by.............

5. If $f(x) = 0$ is an algebraic equation, the Newton-Raphson method is given by $xn_{+1} = xn - f\,(xn)/?$
(*a*) $f\,(x_{n-1})$ (*b*) $f\,'(x_{n-1})$ (*c*) $f\,'(x_n)$ (*d*) $f\,''\,(x_n)$.

6. In the Regula-falsi method of finding the real root of an equation, the curve *AB* is replaced by......

7. Newton's iterative formula to find the value of $\sqrt{N}$ is..............

8. A root of $x^3 - x + 4 = 0$ obtained using the bisection method correct to two places, is........ .

9. Newton-Raphson formula converges when............ .

10. In the case of bisection method, the convergence is
(*a*) linear (*b*) quadratic (*c*) very slow.

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12. Using Newton's method, the root of $x^3 = 5x - 3$ between 0 and 1 correct to two decimal places, is........ .

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(*c*) $f\,'(x)$ is zero (*d*) Never fails.

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19. The iterative formula for finding the reciprocal of N is x_{n+1} =......... .

20. While finding the root of an equation by the method of false position, the number of iterations can be reduced...... .

Answer:

1. (a).

2. $x_{n+1} = \frac{1}{3}\left(2x_n + N / x_n^2\right)$.

3. $x_{n+1} = \frac{1}{2}\left(2x_n + x_{n-1}\right)$.

4. $x_2 = x_0 - \frac{x_1 - x_0}{f(x_1) - f(x_0)} f(x_0)$.

5. (c).

6. Chord AB.

7. $x_{n+1} = \frac{1}{2}(x_n + N / x_n)$.

8. 1.79.

9. Initial approximation is chosen sufficiently close to the root.

10. (c)

11. Newton-Raphson method.

12. 0.657.

13. (c).

14. $|\phi'(x)| < 1$.

15. If we start with a smaller interval for the root.

16. True

17. 2.1.

18. (2, 3)

19. $x_n (2 - Nx_n)$

20. If we start with a smaller interval for the root.

MCQ on FINITE DIFFERENCES

Select the correct answer or fill up the blanks in the following questions:

1. $\Delta\nabla =$

(*a*) $\nabla\Delta$ (*b*) $\nabla + \Delta$ (*c*) $\nabla - \Delta$.

2. Which one of the following results is correct:

(*a*) $\Delta x^n = nx^{n-1}$ (*b*) $\Delta x^{(n)} = nx^{(n-1)}$

(*c*) $\Delta^n e^x = e^x$ (*d*) $\Delta \cos x = -\sin x$.

3. If $f(x) = 3x^3 - 2x^2 + 1$, then $\Delta^3 f(x) = \cdots$

4. The relationship between the operators E and D is$\cdots$.

5. The $(n + 1)$th order difference of the nth degree polynomial is$\cdots$

6. If $y(x) = x(x - 1)(x - 2)$, then $\Delta y(x) = \cdots$. .

7. $x^3 - 2x^2 + x - 1$ in factorial form $= \cdots$...

8. Taking $h$as the interval of differencing, $\Delta^2 x^3 = \cdots$

9. In terms of E,$\Delta = \cdots$.

10. The form of the function tabulated at equally spaced intervals with sixth differences constant, is$\cdots$

11. If the interval of differencing is unity, then $\Delta^4[(1 - x)(1 - 2x)(1 - 3x)] = \cdots$

12. Taking the interval of differencing as unity, the first difference of $x^4 - 3x^3 + 2x - 1$ is $\cdots$.

13. The missing values of y in the following data:

yx:	0	...	...	...	25
Δyx:	1	2	4	7	11,

are$\cdots$.

14. $\Delta^3[(1-x)(1-3x)(1-5x)] = \cdots$(interval of differencing being 1)

15. $\Delta \tan^{-1} x = \cdots$.

16. If $y = x^2 - 2x + 2$, taking interval of differencing as unity,$\Delta^2 y = \cdots$.

17. Relation between Δ and E is given by$\cdots$..

18. The kth difference of a polynomial of degree k is$\cdots$

19. $\Delta^r y_k$ in terms of backward differences $= \cdots$.

20. The value of $(\Delta^2/E)e^x = \cdots$.

21. The relation between the shift operator E and second order backward difference operator Δ^2 is$\cdots$

22. The value of $\Delta^n(e^x) = \cdots$(intervalofdifferencingbeing1).

23. Relationship between E, Δ and Δ is$\cdots$

24. If the fifth and higher order differences of a function vanish, then the function represents a polynomial of degree$\cdots$.

25. The value of $E^{-1}\Delta = \cdots$.

26. If $E^2 u_x = x^2$ and $h = 1$, then $u_x = \cdots$.

27. Given $y_0 = 2$, $y_1 = 4$, $y_2 = 8$, $y_4 = 32$,then $y_3 = \cdots$.

28. $y_0 = 1$, $y_1 = 5$, $y_2 = 8$, $y_3 = 3$, $y_4 = 7$, $y_5 = 0$, then $\Delta^5 y_6 =$

(*a*) 61 (*b*) – 62

(*c*) 62 (*d*) – 61.

29. Given $x = 1\ 2\ 3$

$f(x) = 3\ 815$, then $\Delta^2 f(1) =$

(*a*) 3 (*b*) 4

(*c*) 2 (*d*) 1

30. $(E^{1/2} + E^{-1/2})(1+\Delta)^{1/2} =$

(*a*) $\Delta + 1$ (*b*) $\Delta - 1$

(*c*) $\Delta + 2$ (*d*) $\Delta - 2$.

31. Which one is incorrect?

(*a*) $E = 1 + \Delta$ (*b*) $\Delta(5) = 0$

(*c*) $\Delta(f_1 + f_2) = \Delta f_1 + \Delta f_2$ (*d*) $\Delta(f_1 . f_2) = \Delta f_1 + \Delta f_2$.

32. $\Delta - \nabla = \delta^2$. (True or False)

33. $\Delta + \nabla = E + E^{-1}$. (True or False)

34. $E = e^{-hD}$. (True or False)

35. If $f(x) = e^x$, then $\Delta^6 e^x = (e^h - 1)^6 e^x$. (True or False)

36. $\Delta^n = \delta^n E^{n/2}$ (True or False)

37. $(1 + \Delta)(1 - \nabla) = 1$. (True or False)

38. With the usual notations, match the items on right hand side with those in left hand side:

(*i*) $E\nabla$	(*a*) $\frac{1}{2}(\Delta + \nabla)$
(*ii*) hD	(*b*) $\Delta - \nabla$
(*iii*) $\nabla\Delta$	(*c*) Δ
(*iv*) $\mu\delta$	(*d*) $-\log(1 - \nabla)$

Answer:

1. (*a*). **2.** (*b*). **3.** 18. **4.** $E = e^{hD}$.

5. zero. **6.** $3x(x - 1)$ **7.** $[x]^3 + [x]^2 - 1$. **8.** $6h^2(x + h)$.

9. $1 - E^{-1}$. **10.** a polynomial of the 6th degree. **11.** zero.

12. $4x^3 - 3x^2 - 5x$. **13.** 1, 3, 7. **14.** – 90

15. $\tan^{-1}\left(\frac{h}{1 + hx + x^2}\right)$. **16.** 2.

17. $\Delta = E - 1$. **18.** Constant. **19.** $\nabla^r y_{k+r}$ **20.** $e^{-h} \Delta^2 e^x$.

21. $\nabla^2 = (1 - E^{-1})^2$. **22.** $(e - 1)^n e^x$. **23.** $\Delta = E\nabla$. **24.** 5.

25. $\nabla - \nabla^2$. **26.** $(x - 2)^3$. **27.** 16.5. **28.** (*d*). **29.** (*c*).

30. (*c*). **31.** (*d*). **32.** True **33.** False.

34. False. **35.** True. **36.** True. **37.** True.

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30. (*c*).	**31.** (*d*).	**32.** True	**33.** False.
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