Question Bank

Subject: Numerical Methods

Set-I

Topic: Error and Approximation

1. The number of significant digits in 0.00303

(a) 6 (b) 5 **(c) 3** (d) 2

2. When rounded off after 4 decimal places, 0.003256

(a) 0.0032 (b) 0.0033 (c) 0.0326 (d) none of these

3. The number of significant digits in 1.00234

(a) 4 **(b) 6** (c)3 (d) 5

4. The number of significant figures in 0.03409

(a) five (b) six (c) seven **(d) four**

5. The number of significant figures in 6,00,000 is

(a) 1 (b) 7 (c) 0 **(d) 6**

6. The number 3.4506531 when rounded off to 4 places of decimal will give
(a) 3.4506 (b) 3.4507 (c) 3.451 (d) none

7. The significant digit 0.0001234 is
(a) 7 **(b) 4** (c) 8 (d) 6

8. Rounding off the number 0.0063945 correct up to 4 significant figure is
(a) 0.0064 (b) 0.0063 (c) 0.006395 **(d) 0.006394**

9. The percentage error in approximating 4/3 to 1.3333 is-
(a) 0.0025% (b) 25% (c) 0.00025% (d) 0.25%

10. If 5/3 is approximated to 1.6667, then absolute error is-
(a) 0.000033 (b) 0.000043 (c) 0.000045 (d) 0.000051

Topic: Finite Differences

1. Show that

(i) $(\frac{\Delta^2}{E})x^3=6x$

(ii) $\Delta^2 \cos 2x=-4\sin^2 h \cos(2x+2h)$

(iii) $\left(\frac{\Delta^2}{E}\right)e^x.\frac{Ee^x}{\Delta^2 e^x}=e^x$, the interval of difference being h.

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

2. Evaluate

(i) $\Delta^3(1-x)(1-2x)(1-3x)$

Ans: -36

(ii) $\left(\frac{\Delta^2}{E}\right)x^6$, h=1

Ans: 6x

(iii) $\Delta(e^{2x}log3x)$, h=1

(iv) $\Delta^n(e^x)$, h=1

(v) $\frac{\Delta^2 x^3}{Ex^3}$, h=1

3. Find the missing term in the following tables:

(i)	x: 0	1	2	3	4		
	y: 1	3	9	_	81		
(ii)	x: 1	2	3	4	5	6	7
	y: 2	4	8	_	32	64	128

4.

x:	0	1	2	3	4	5
y:	1	10	20	30	40	50

find $\Delta^5 y_0$ by using difference table

5. Find the missing term from the table:

x:	2	4	6	8	10
y:	5	13	*	53	85

6. The shift operator E is equal to
   (a) e^{-hd}
   (b) e^{h}
   (c) e^{hd}
   (d) e
7. $\delta E^{1/2}$ is equal to

(a) ∇

(b)Δ

(c) E

(d)None of these

8. The relation between shift operator E and forward difference operator Δ is

   (a) $\Delta = 1 + E$

   (b) $E = 1 + \Delta$

   (c) $E = \Delta$

   (d) $E = \Delta + 2$

9. The value of $\Delta^2(ax^2 + bx + c)$ is

   (a) 2ah+b

   (b)2ah

   (c) $2ah^2$

   (d)2a

10. 1^{st} order forward difference of a constant is-

   (a) 0

   (b)1

   (c) 2

   (d)3

11. If $f(x)=2x^3-3x^2+4x+5$, then $f(x)$ is

(a) 8

(b) 12

(c) 200

(d) None of these

12. The value of $\Delta^{-1} c$ where c is a constant

(a) c

(b) 0

(c) cx

(d) none of these

13. the (n+1)th order forward difference of nth degree polynomial is

(a) n!

(b) 0

(c) (n+1)!

(d) None of these

14. Which is not true?

(a) $\Delta = E - 1$

(b) $\Delta . \nabla = \Delta - \nabla$

(c) $\frac{\Delta}{\nabla} = \Delta + \nabla$

(d) $\nabla = 1 - E^{-1}$

15. Which of the following is true?

(a) $\Delta^n x^n = (n+1)!$

(b) $\Delta^n x^n = n!$

(c) $\Delta^n x^n = 0$

(d) $\Delta^n x^n = n$

16. Taking h=1, the value of $\Delta^3[(1-x)(1-2x)(1-3x)]$is

(a) 36

(b)37

(c) -35

(d)-36

17. $\Delta(\frac{1}{x})$ is equal to

(a) $\frac{1}{x(x+h)}$

(b) $\frac{1}{x+h}$

(c) $\frac{-h}{x+h}$

(d) $\frac{-\boldsymbol{h}}{\boldsymbol{x(x+h)}}$

18. $\frac{1}{\Delta} - \frac{1}{\nabla}$ is equal to

(a) 1

(b) -1

(c) Δ

(d) ∇

19. $\frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$ is equal to

(a) 0

(b) $\Delta - \nabla$

(c) $\nabla - \Delta$

(d) $\nabla + \Delta$

20. $\Delta^{10}[(1-ax)(1-bx^2)(1-cx^3)(1-dx^4)]$ is equal to

(a) 10!abcd

(b)abcd

(c) 0

(d)None of these

21. $\Delta^{10}[(1-x)(1-2x\ \ )(1-3x\ \ )\ldots\ldots(1-10x\ \ )]$, h=1 is equal to

(a) 10!

(b)9!

(c) $(10!)^2$

(d)None of these

22. $(1+\Delta)(1-\nabla) =$

(a) 1

(b)-1

(c) 0

(d)None of these

Topic: Interpolation

1. Find f(1.1) from the following table

x:	1	2	3	4	5
y:	7	12	29	64	123

2. Find f(4.5) from table

x:	0	1	2	3	4	5
y:	0	3	8	15	24	35

3. Given the following score distribution of statistics.

x:	30-40	40-50	50-60	60-70
y:	52	36	21	14

Find (a) the number of students scoring below 35 marks; (b) the number of students scoring above 65 marks and (c) the number of students scoring between 35-45 marks.

4. Use the following table to compute f(0.02) and f(0.35)

x:	0.0	0.1	0.2	0.3	0.4
f(x):	1.0000	1.1052	1.2214	1.3499	1.4918

5. Find f(2) from this given table:

x:	0	1	3	4
f(x):	5	6	50	105

6. Apply Lagrange's formula to find f(5), given that f(1)=2, f(2)=4, f(3)=8, f(4)=16, f(7)=128.
7. Using Newton's divided difference formula, calculate f(3)

x:	0	1	2	4	5	6
f(x):	1	14	15	5	6	19

8. Divided difference formula is used for
   a) Equispaced point
   b) Unequally spaced point

c) Both (a) and (b)

d) None of these

9. In interpolation the value of x lies

(a) Between smallest and largest value of x

(b) Outside the range of max. and min. values of x.

(c) May be anything

(d) Half of the smallest and largest value of x.

10. In Newton's forward interpolation, the interval should be-

(a) Equally spaced

(b) Not equally spaced

(c) May be equally spaced.

(d) Both (a) and (b)

11. Lagrange's interpolation formula deals with

(a) Equispaced arguments only

(b) Unequispaced arguments only

(c) Both (a) and (b)

(d) None of these

12.In Lagrange's polynomial the sum of the coefficients is

(a) 0

(b)2

(c) 1

(d)None of these

13.If f(x)=1/x, then divided difference f(a,b) is

(a) $(a+b)/(ab)^2$

(b) $-(a+b)/(ab)^2$

(c) $1/(a^2-b^2)$

(d)$1/a^2-1/b^2$

14.If f(0)=12, f(3)=6 and f(4)=8, then the linear interpolation function f(x) is

(a) $x^2-3x+12$

(b)x^2-5x

(c) x^3-x^2-5x

(d) $x^2-5x+12$

15.Newton's forward interpolation formula is used

(a) Near the beginning of the tabulated values

(b)Near the end of the tabulated values

(c) Near the middle of the tabulated values

(d)None of these

16.Lagrange interpolation formula is used

(a) Near the beginning of the tabulated values

(b)Near the end of the tabulated values

(c) Near the middle of the tabulated values

(d)All of these

Topic: Numerical Integration

1. Evaluate $\int_0^5 \frac{dx}{1+x}$ by Trapezoidal rule taking h=1.
2. Evaluate $\int_{0.1}^{0.7} (e^x + 2x)dx$ by Simpson's 1/3rd rule taking 6 intervals.
3. Compute $\int_0^{\frac{\pi}{2}} \sqrt{cos\theta} d\theta$ by Simpson's one-third rule taking h=15^0
4. Calculate $\int_2^{10} \frac{dx}{1+x}$ by Simpson's 1/3rd rule(use 8 equal parts)
5. Evaluate $\int_0^{1/2} \frac{dx}{\sqrt{1-x^2}}$ by Weddle's rule, taking n=6.

6. The velocity v of a particle moving in a straight line covers a distance x in time t.

x:	0	10	20	30	40
v:	45	60	65	54	42

Find the time taken to traverse the distance of 40 units.

7. In evaluating $\int_a^b f(x)dx$, the error in Trapezoidal rule is order of-

(a) h^2

(b) h^3

(c) h^4

(d) h

8. The truncation error in Simpson's one-third rule is order-

(a) h^3

(b) h^4

(c) h^5

(d) none

9. The inherent error of Weddle's rule is

(a) $-\frac{nh^5}{180} f^{iv}(x_0)$

(b) $-\frac{nh^7}{180} f^{iv}(x_0)$

(c) - $\frac{nh^7}{840} f^{iv}(x_0)$

10. Simpson's 1/3rd rule requires the interval to be divided into an odd number of sub-intervals
    (a) TRUE
    (b)FALSE
11. The degree of precision of Simpson's one third rule is-
    (a) 1
    (b)2
    (c) 3
    (d)5
12. In Weddle's rule, the number of equal sub-intervals is-
    (a) Multiple of 3
    (b)Multiple of 6
    (c) Multiple of 9
    (d)None of these

13. The degree of precision in Trapezoidal rule

(a) 2

(b)1

(c) 0

(d)3

14. The error in Weddle's rule is of order

(a) h^5

(b)h^4

(c) h^7

(d)h^6