Roll. No. .....

O.M.R. Serial No. | | | | | | | | |

Question Booklet Number

BCA (SEM.-V) (NEP) (SUPPLE.)EXAMINATION, 2024-25

COMPUTER APPLICATION

(Numerical Methods)

[BCA-5004]

Paper Code							
Z	0	1	0	1	1	1	T

Question Booklet Series

A

Time : 1 : 30 Hours **Max. Marks : 75**

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.
4. Four alternative answers are mentioned for each question as - A, B, C & D in the booklet. The candidate has to choose the correct / answer and mark the same in the OMR Answer-Sheet as per the direction :

(Remaining instructions on last page)

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, उसे तुरन्त बदल लें।
4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर- A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छाँटना है। उत्तर को OMR उत्तर-पत्रक में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

(शेष निर्देश अन्तिम पृष्ठ पर)

1. The backward difference ∇ is given by :

(A) $\nabla f(x) = f(x) + f(x-h)$

(B) $\nabla f(x) = f(x) - f(x-h)$

(C) $\nabla f(x) = f(x+h) - f(x)$

(D) $\nabla f(x) = f(x-h) - f(x+h)$

2. If $f(x) = x^2$, then the forward difference $\Delta f(x)$ with step size $h = 1$ is :

(A) $2x - 1$

(B) $x^2 + 1$

(C) $2x$

(D) $2x + 1$

3. The relation between the forward difference Δ and shift operator E is :

(A) $\Delta = E + 1$

(B) $\Delta = E - 1$

(C) $\Delta = E \times 1$

(D) $\Delta = E / 1$

4. If $\Delta^2 f(x) = 0$ for all x, then $f(x)$ must be a :

(A) Linear function

(B) Quadratic function

(C) Cubic function

(D) Constant function

5. For a polynomial of degree n, the nth forward difference is :

(A) Always zero

(B) Equal to factorial of n

(C) Constant and non-zero

(D) Always increasing

6. The nth forward difference of x^n is :

(A) $2n$

(B) $n!$

(C) $n - 1!$

(D) None of these

7. Gauss elimination method is used for :

(A) Solve non-linear equation

(B) Solve system of linear equation

(C) Find eigenvalues

(D) Perform matrix inversion only

8. In Gauss elimination the system of equations is first transformed into :

(A) Diagonal form

(B) Upper triangular

(C) Lower triangular

(D) Identity matrix

9. In Gauss elimination, the step of subtracting a multiple of one raw from another raw is called :

(A) Forward elimination

(B) Backward substitution

(C) Pivating

(D) Scaling

10. Gauss-Seidel method is an :

(A) Direct method

(B) Iterative method

(C) Graphical method

(D) Optimization method

11. The trapezaidal rule is exact for which type of function :

(A) Linear

(B) Constant

(C) Quadratic

(D) Cubic

12. $\int_0^1 (1+x^2)dx$ using trapezaidal rule with 2 intervals :

(A) 1·33

(B) 1·5

(C) 1·25

(D) 1·666

13. Simpson's 1/3 rule requires how many intervals to apply?

(A) add number of intervals

(B) only one interval

(C) even number of intervals

(D) any number of intervals

14. The condition for applying bisection method on interval [a, b] is :

(A) $f(a) \cdot f(b) > 0$

(B) $f(a) \cdot f(b) = 0$

(C) $f(a) + f(b) = 0$

(D) $f(a) \cdot f(b) < 0$

15. If the initial interval is [a, b], after n iterations the interval length is :

(A) $\frac{b-a}{n}$

(B) $\frac{b-a}{2^n}$

(C) $\frac{b-a}{n^2}$

(D) $\frac{b-a}{3^n}$

16. Find one root of $f(x) = x^2 - 3$ using the bisection method on interval $[1, 2]$ after 1 iteration.

(A) 1·25

(B) 1·5

(C) 1·75

(D) 1·0

17. The bisection method is used to :

(A) Find the derivate of a function

(B) Find the roots of non-linear function

(C) Solve linear equation

(D) None of these

18. Find $\Delta \log x$:

(A) $\log\left(\frac{x+h}{x}\right)$

(B) $\log\left(\frac{x}{x+h}\right)$

(C) $\log(x+h)$

(D) $\log x$

19. Taking n to be the interval of differencing, find $\Delta^2(e^x)$:

(A) $e^x(e^n-1)^3$

(B) $e^n(e^x-1)^2$

(C) $e^x(e^n+1)^2$

(D) $e^x(e^n-1)^2$

20. Which method can be used for both equal and unequal intervals?

(A) Stirling's formula

(B) Bessel's formula

(C) Lagrange's method

(D) Newton's method

21. If step size is h is halved in the trapezaidal rule, the error will approximately :

(A) double

(B) reduce by half

(C) reduce by one-fourth

(D) remains unchanged

22. The regula falsi method formula for new approximation is :

(A) $x=\frac{a+b}{2}$

(B) $x=b-\frac{f(b)(b-a)}{f(b)-f(o)}$

(C) $x=\frac{af(b)-bf(a)}{f(b)-f(o)}$

(D) Both (B) and (C) are equivalent

23. The Newton Raphson method is derived from :

(A) Bionomial theorem

(B) Lagrange's interpolation

(C) Fourier series

(D) Taylor series

24. Newton-Raphson method fails if :

(A) $f'(x_0)>0$

(B) $f'(x_0)<0$

(C) $f'(x_0)\neq 0$

(D) $f'(x_0)=0$

25. In Newton-Raphson method, the convergence is :

(A) Linear

(B) Quadratic

(C) Very slow

(D) None of these

26. Stirling's formula uses :

(A) Forward difference only

(B) Backward difference only

(C) Average of forward and backward difference

(D) Divided difference

27. The parameter u in Stirling's formula is defined as :

(A) $u = \frac{x - x_0}{n}$

(B) $u = \frac{x - x_0}{n}$, where x_0 is the middle value

(C) $u = x / n$

(D) $u = \frac{x - x_n}{n}$

28. Stirling's formula is useful for calculating :

(A) only interpolated values

(B) only first derivatives

(C) both interpolated values and derivatives

(D) only second derivative

29. In Newton-Gregory forward formula, the parameter u is defined as :

(A) $u = \frac{x - x_n}{n}$

(B) $u = \frac{x - x_0}{n}$

(C) $u = xn$

(D) $u = \frac{n}{x - x_0}$

30. The first term of the Newton-Gregory forward formula is always :

(A) y_0

(B) y_1

(C) Δy_0

(D) Δy_n

31. In Newton-Gregory backward formula, the parameter u is defined as :

(A) $u = \frac{x - x_n}{n}$

(B) $u = \frac{x - x_0}{n}$

(C) $u = xn$

(D) $u = \frac{n}{x - x_n}$

32. Newton-Cotes formula are used for :

(A) Solving algebric equation

(B) Numerical differentiation

(C) Numerical integration

(D) Solving differential equation

33. The Trapezaidal rule is a Newton-Cotes formula of which degree :

(A) 0

(B) 1

(C) 2

(D) 3

34. Newton divided difference formula can handle :

(A) equally spaced points only

(B) unequally spaced points only

(C) both equally and unequally spaced points

(D) only linear functions

35. The term $f(x_0, x_1, x_2, x_3)$ in divided difference represents :

(A) First order difference

(B) Second order difference

(C) Third order difference

(D) Fourth order difference

36. If the function $f(x)$ is a polynomial of degree n, the nth order divided difference is :

(A) Zero

(B) Constant

(C) Infinite

(D) None of these

37. For the points (0, 1), (1, 3), (2, 7) the second divided difference is :

(A) 1

(B) 2

(C) 3

(D) 4

38. For points (0, 0), (1, 1), (2, 4), (3, 9) the Newton divided difference polynomial will exactly represent :

(A) Linear function

(B) Quadratic function

(C) Cubic function

(D) Non-polynomial

39. Given points (0, 1), (1, 3), (2, 7) use Lagrange's formula to find $f(3)$:

(A) 10

(B) 13

(C) 15

(D) 17

40. The Lagrange's formula with 4 points will always give a polynomial of degree :

(A) 3

(B) 4

(C) ≤ 3

(D) ≤ 4

41. If interpolation points are equally spaced, Lagrange interpolation as equivalent to :

(A) Runge-Kutta method

(B) Trapezaidal rule

(C) Central difference method

(D) Newton forward/backward interpolation

42. For equally spaced arguments, relation between operator is :

(A) $\Delta = nD$

(B) $\in = 1 + nD$

(C) $\nabla = \in^{-1} - 1$

(D) All of the above

43. Gauss forward formula is based on which operator?

(A) Forward difference operator

(B) Backward difference operator

(C) Central difference operator

(D) Shift opeartor

44. In Bessel's formula, first term used is :

(A) y_0

(B) y_1

(C) $\frac{y_1 + y_2}{2}$

(D) $\frac{y_0 + y_1}{2}$

45. Which of the followingis a central difference formula?

(A) Sterling's formula

(B) Bessel's formula

(C) Everett's formula

(D) All of the above

46. Bessel's formula is more accurate than stirling's when :

(A) u is near 0

(B) u is near 1

(C) u is near 1/2

(D) u is near integer values

47. For tabulated data with G = 1, if $f(0) = 1, f(1) = 8, f(2) = 27, f(3) = 64$, then using Bessel's formula find $f(1.5)$:

(A) 15

(B) 15·5

(C) 16

(D) 16·5

48. Step size n is Gauss backward formula must be :

(A) equal

(B) unequal

(C) increasing

(D) variable depending on x

49. Numerical differentiation is generally:

(A) exact

(B) approximate

(C) not useful

(D) only for linear function

50. If $\Delta y_0 = 3$, $\Delta^2 y_0 = 2$, $u = .25$ $y_0 = 1$ then $y(1.25)$ using Newton forward formula :

(A) 1·75

(B) 1·78

(C) 1·79

(D) 1·80

51. Euler's method is used to solve :

(A) Algebric question

(B) Ordinary differntial equation

(C) Partial differential equation

(D) Integral equations

52. Euler's method is of which order of accuracy?

(A) First-order

(B) Second-order

(C) Third-order

(D) Fourth-order

53. Using Euler's method, approximate $y(.2)$ for

$$\frac{dy}{dx} = x + y,\ y(0) = 1,\ h = \cdot 1$$

(A) 1·21

(B) 1·22

(C) 1·23

(D) 1·24

54. For $\frac{dy}{dx} = x^2 + y^2,\ y(0) = 0,\ n = \cdot 1$.

Find first step y_1 using Euler's method:

(A) 0

(B) 0·01

(C) ·1

(D) 0·05

55. Picard's method is based on :

(A) Taylor series expansion

(B) Finite differences

(C) Runge Kutto formula

(D) Successive approximation

56. The main advantage of Runge-Kutta method over Euler's method is :

(A) Simpler formula

(B) Higher accuracy without reducing step size

(C) Require less computation

(D) None of these

57. The order of the classical RK4 method is :

(A) 1

(B) 2

(C) 3

(D) 4

58. If $f(x) = x^2, h = -1$ approximate $f'(1)$ using backward difference :

(A) 2

(B) 2·1

(C) 1·9

(D) 2·05

59. Solve the linear equation using one iteration of Gauss-Seidel method. (initial guass $x = 0, y = 0$)

$$x + y = 4$$
$$2x + 3y = 9$$

(A) $x_1 = 3,\ y_1 = 1$

(B) $x_1 = 4,\ y_1 = .333$

(C) $x_1 = 2,\ y_1 = 2$

(D) $x_1 = 1,\ y_1 = 3$

60. Gauss Seidel method requires the coefficient matrix to be :

(A) Singular

(B) Non-singular

(C) Any square matrix

(D) Diagonal

61. Which difference are used in Gauss Third formula?

(A) Forward difference

(B) Backward difference

(C) Central difference

(D) Divided difference

62. By putting $n = 2$, in general quadrative formula which of the following rule is derived :

(A) Simpson's 3/8th rule

(B) Tropezaidal

(C) Weddle's rule

(D) Simpson's 1/3rd rule

63. Evaluate $\left(\frac{\Delta^2}{E}\right)x^3$:

(A) $6x^2$

(B) $12x^2$

(C) $6x$

(D) None of these

64. $(1+\Delta)(1-\nabla)$ equal to :

(A) 0

(B) -1

(C) 1

(D) None of these

65. Find the missing term for following data :

x	1	2	3	4	5	6	7
y	2	4	8	–	32	64	128

(A) 15·1

(B) 16·1

(C) 18·1

(D) 14·1

66. $f(x) = x^2 - 2$ with initial Guass $x_0 = 1$ one iteration of Newton Raphson :

(A) 1·2

(B) 1·3

(C) 1·5

(D) 2·0

67. For $\frac{dy}{dx} = x + y,\ y(0) = 1$, step size $n = .1$ using Runge-Kutta method. Find $y(.1)$:

(A) 1·11

(B) 1·105

(C) 1·12

(D) 1·13

68. Use Picard's method to approximate y at first approximation for $x = .2$, given that $y = 1$ when $x = 0$, and $\frac{dy}{dx} = x - y$:

(A) ·82

(B) ·81

(C) ·83

(D) None of these

69. Numerical differentaiation is mainly based on :

(A) Gauss-elimination

(B) Interpolation formula

(C) Trapezaidal rule

(D) Newton-Raphson

70. Newton forward interpolation formula can be used for differentiation at :

(A) Begining of the table

(B) Middle of the table

(C) End of the table

(D) None of the above

71. The equation which include trignometric, exponential and lagarithmic functions are known as ____ equations.

(A) Polynomial

(B) Algebraic

(C) Specials

(D) Transcendental

72. The process of finding the value inside the interval $(x_0,\ x_n)$ is called :

(A) Interpolation

(B) Extrapolation

(C) Iterative

(D) Polynomial equation

73. In Euler's method, y_{n+1} =.....

(A) y_n

(B) $y_n + f(x_n, y_n)$

(C) $y_n + nf(x_n, y_n)$

(D) None of the above

74. The first order divided difference for arguments x_0 and x_1 is :

(A) $f(x_1) - f(x_0)$

(B) $\frac{f(x_1) + f(x_0)}{x_1 - x_0}$

(C) $\frac{f(x_1) - f(x_0)}{x_1 - x_0}$

(D) None of the above

75. The trapezaidal rule to find the value of $I = \int_a^b f(x)dx$ for the entries y_0, y_1, y_2, y_3, y_4 is :

(A) $n[(y_0 + y_4) + 2(y_1 + y_2 + y_3)]$

(B) $n/2[(y_0 + y_4) + 4(y_1 + y_2 + y_3)]$

(C) $n/2[(y_0 + y_1) + 2(y_1 + y_2 + y_3)]$

(D) $n/2[(y_0 + y_4) + 2(y_1 + y_2 + y_3)]$

76. $E[f(x-n)] =$ _____

(A) $f(x-n)$

(B) $f(x-2n)$

(C) $f(x)$

(D) None of the above

77. Inverse shift operator $E^{-1}[f(x-n)] =$ _____.

(A) $f(x)$

(B) $f(x+n)$

(C) $f(x-n)$

(D) $f(x-2n)$

78. $\nabla f(x-2n) =$ _____

(A) $f(x-2n)-f(x)$

(B) $f(x-2n)-f(x-3n)$

(C) $f(x+n)-f(x)$

(D) None of the above

79. The derivative of $f(x)$ at $x = 1$ using forward difference formula with $n = 1$

$$f'(x) = \frac{f(x+n)-f(x)}{n}$$

for $f(x) = x^2$ is :

(A) 1

(B) 2

(C) 3

(D) 4

80. Which is the correct relation between D and E is :

(A) $D = E^n$

(B) $E = e^{nD}$

(C) $D = E - 1$

(D) None of the above

81. Which of the following gives the central difference operator $\delta f(x)$?

(A) $f(x+h)-f(x)$

(B) $f(x)-f(x-h)$

(C) $f\left(x+\frac{h}{2}\right)-f\left(x-\frac{h}{2}\right)$

(D) None of the above

82. Which interpolation formula is gerenally prefered for numerical differentiation at the end-points of a table?

(A) Newton forward formula

(B) Lagrange's formula

(C) Central difference formula

(D) Newton backward formula

83. Bessel's interpolation formula is used when the required value lies :

(A) near the beginning of the table

(B) near the end of the table

(C) near the middle of the table

(D) outside the table

84. The first term in Bessel's formula is :

(A) y_0

(B) y_1

(C) $\frac{y_0 + y_1}{2}$

(D) Δy_0

85. Gauss third formula is derived from :

(A) Newton forward and backward

(B) Gauss forward and backward

(C) Stirling's and Bessel's

(D) None of the above

86. If the initial interval is [1, 3] and $f(1).f(3) < 0$, mid point after first iteration is :

(A) 1

(B) 2

(C) 2·5

(D) 3

87. The Bisection method requires the function $f(x)$ to be :

(A) Continuous in the interval [a,b]

(B) Differentiable in the interval [a, b]

(C) Not continuous

(D) Continuous

88. Which of the following is a necessary condition for applying Regula Falsi method?

(A) $f(a) = f(b)$

(B) $f(a) \cdot f(b) > 0$

(C) $f'(x) = 0$

(D) $f(a) \cdot f(b) < 0$

89. Regula Falsi method is also called :

(A) Method of Ralf-interval

(B) Sccant method

(C) Newton Raphson method

(D) Method of false position

90. The Regula Falsi method always require :

(A) Function derivative

(B) Initial Gauss only

(C) Only one function value

(D) Function values at two points with opposite sign

91. Newton Raphson method requires :

(A) Function value only

(B) Function and its derivative

(C) Function and second derivative

(D) Function values at two points

92. Which of the following is a disadvantage of Newton Raphson method?

(A) Requires derivative

(B) May fail if derivative is zero

(C) Convergence not guaranted for poor initial Gauss

(D) All of the above

93. Central difference operator δ can be expressed in terms of E as :

(A) $\delta = \frac{E + E^{-1}}{2}$

(B) $\delta = \frac{E - E^{-1}}{2}$

(C) $\delta = E - 1$

(D) $\delta = E + 1$

94. Shift operator is commonly used in :

(A) Numerical differentiation

(B) Numerical integration

(C) Finite differences

(D) None of the above

95. The method of raw interchanging in Gauss elimination is also called :

(A) Backward substitution

(B) Pivating

(C) Forward elimination

(D) Scaling

96. Backward subsitituion in Gauss elimination starts from :

(A) First equation

(B) Last equation

(C) Middle equation

(D) Any equation

97. In Simpson's 3/8 rule, h is :

(A) $h = \frac{b - a}{2}$

(B) $h = \frac{b - a}{3}$

(C) $h = b - a$

(D) $h = \frac{b - a}{4}$

98. Simpson's 3/8 rule give exact results for :

(A) Linear functions only

(B) Quadratic functions only

(C) Cubic functions

(D) None of the above

99. Newton forward formula uses which type of differences?

(A) Δ (Forward)

(B) ∇ (Backward)

(C) δ (Central)

(D) Divided difference

100. Newton forward interpolation is a :

(A) Direct method

(B) Iterative method

(C) Graphical method

(D) None of the above

Rough Work

Example :

Question :

Q.1 Ⓐ ● Ⓒ Ⓓ

Q.2 Ⓐ Ⓑ ● Ⓓ

Q.3 Ⓐ ● Ⓒ Ⓓ

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.

6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.

7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.

8. After the completion of the examination, candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.

9. There will be no negative marking.

10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.

11. To bring and use of log-book, calculator, pager & cellular phone in examination hall is prohibited.

12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

Impt. On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

उदाहरण :

प्रश्न :

प्रश्न 1 Ⓐ ● Ⓒ Ⓓ

प्रश्न 2 Ⓐ Ⓑ ● Ⓓ

प्रश्न 3 Ⓐ ● Ⓒ Ⓓ

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।

6. सभी उत्तर केवल ओ०एम०आर० उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।

7. ओ०एम०आर० उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।

8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।

9. निगेटिव मार्किंग नहीं है।

10. कोई भी रफ कार्य, प्रश्न-पुस्तिका में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।

11. परीक्षा-कक्ष में लॉग-बुक, कैल्कुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।

12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

महत्वपूर्णः प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्नपुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्नपुस्तिका प्राप्त कर लें।