BRAINWARE UNIVERSITY

Term End Examination 2020 - 21

Programme – Bachelor of Computer Applications

Course Name – Numerical Methods

Course Code - BCA504B

Semester / Year - Semester V

Time allotted : 85 Minutes Full Marks : 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 70=70

1. *(Answer any Seventy)*

(i)

If $E = e_1 e_2$ with $e_1 = 5.43, e_2 = 3.82$ and if error in both e_1, e_2 is 0.01, then the relative error of E is

a) 0.0425

b) 0.0045

c) 0.045

d) None.

(ii)

For an equation like $x^2 = 0$, a root exists at x=0. The Bisection method cannot be adopted to solve this equation in spite of the root existing at x=0 because the function $f(x) = x^2$

a) is a polynomial

b) has repeated roots at x=0

c)

is always non-negative

d)

slope is zero at x=0

(iii)

The Newton-Raphson iterative formula for finding the square root of a real number R is

a)

$$x_{i+1} = \frac{x_i}{2}$$

b)

$$x_{i+1} = \frac{3x_i}{2}$$

c)

$$x_{i+1} = \frac{1}{2}\left(x_i + \frac{R}{x_i}\right)$$

d)

None of these.

(iv)

One of the roots of the equation $x^2 + 2x - 2 = 0$ lies between

a)

1 and 2

b)

0 and 0.5

c)

0.5 and 1

d)

none of these.

(v)

In Gaussian elimination method, the given system of equations represented by $AX = B$ is converted to another system $UX = Y$ where U is

a)

diagonal matrix

b)

null matrix

c)

identity matrix

d)

upper triangular matrix.

(vi)

A square matrix $[A]_{nxn}$ is diagonally dominant if

a)

$|a_{ii}| \geq \sum_{j=1, j\neq i}^{n} |a_{ij}|, i = 1, 2, \ldots, n$

b)

$|a_{ii}| \leq \sum_{i=1, i\neq i}^{n} |a_{ij}|, i = 1, 2, \ldots, n$

c)

$|a_{ii}| > \sum_{j=1, j\neq i}^{n} |a_{ij}|, i = 1, 2, \ldots, n$

d)

$|a_{ii}| \geq \sum_{j=1,}^{n} |a_{ij}|, i = 1, 2, \ldots, n$

(vii)

Let $A = \begin{pmatrix} 1 & 1 & 2 \\ 1 & 1 & 3 \\ 2 & 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 2 & 3 \\ 2 & 2 & 4 \\ 9 & 8 & 7 \end{pmatrix}$

Consider the following statements:

S1:LU decomposition for the matrix A is possible.

S2:LU decomposition for the matrix B is not possible.

a) Both S1 and S2 are true.

b) only S1 is true

c) only S2 is true

d) neither S1 nor S2 is true.

(viii)

The percentage error in approximating $\frac{4}{3}$ to 1.3333 is

a) 0.0025%

b) 25%

c) 0.00025%

d) 0.25%

(ix)

In Regula-Falsi method, the n-th approximate root(x_n) lies between a_n and b_n, then the next approximate root is

a) $x_{n+1} = a_n - \frac{f(a_n)}{f(a_n)-f(b_n)}(b_n - a_n)$

b) $x_{n+1} = a_n - \frac{f(b_n)}{f(a_n)-f(b_n)}(a_n - b_n)$

c) $x_{n+1} = a_n - \frac{f(a_n)}{f(b_n)-f(a_n)}(b_n - a_n)$

d) $x_{n+1} = a_n + \frac{f(a_n)}{f(a_n)+f(b_n)}(b_n - a_n)$

(x)

The value of $(1+\Delta)(1-\nabla)$is

a) 0

b) 1

c) 2

d) 3

(xi)

$\nabla^3(y_0)$may be expressed as which of the following terms?

a) $y_3 - 3y_2 + 3y_1 - y_0$

b) $y_2 - 2y_1 + y_0$

c) $y_3 + 3y_2 + 3y_1 + y_0$

d) None of these

(xii)

If y=f(x) are known only at (n+1) distinct interpolating points then the Lagrangian polynomial has degree

a)

b)

at most n

at least n

c)

exactly n

d)

exactly n+1

(xiii)

In Newton's forward difference interpolation, the value of $s = \frac{x-x_0}{h}$ lies between

a)

1 and 2

b)

-1 and 1

c)

0 and ∞

d)

0 and 1

(xiv)

Which of the following is not true?

a)

$\Delta.\nabla = \nabla - \Delta$

b)

$\Delta.\nabla = \Delta - \nabla$

c)

d)

$E.\Delta = \Delta.E$

$\Delta + 1 = E$

(xv)

If Δ and ∇ are the forward and backward difference operators respectively, then $\Delta - \nabla$ is equal to

a)

$\Delta + \nabla$

b)

$\Delta.\nabla$

c)

$-\Delta.\nabla$

d)

$\frac{\Delta}{\nabla}$

(xvi)

If Δ and ∇ are the forward and backward difference operators respectively, then which of the following is not correct?

a)

$\Delta^m.\nabla^n = \Delta^n.\nabla^m$

b)

$\Delta^m.\Delta^n = \Delta^{m+n}$

c)

$\Delta.\nabla = \nabla.\Delta$

d)

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

(xvii)

If Δ and ∇ are the forward and backward difference operators respectively and E be the shifting operator, then which of the following is correct?

a)

$\nabla = 1 + E$

b)

$\Delta = 1 + E$

c)

d)

$\nabla = -1 + E$

$\Delta = -1 + E$

(xviii)

The value of $\left(\frac{\Delta^2}{E}\right) x^2$ is

a) 2

b) 3

c) 4

d) 6

(xix)

The second degree polynomial passes through (0,1),(1,3),(2,7),(3,13) is

a)

$x^2 + 2x + 2$

b)

$x^2 - x + 2$

c)

$x^2 + x + 1$

d)

$x^2 + x + 2$

(xx)

The n-th divided difference of n degree polynomial $a_0.x^n + a_1.x^{n-1} + a_2.x^{n-2} + \ldots + a_n (a_0 \neq 0)$ is

a)

$a_0 x + a_1$

b)

a_0

c)

a_n

d)

none of these.

(xxi)

A root of the equation $x^3 - x - 1 = 0$ needs to be found by Newton-Raphson method. If the initial guess x_0 as 2, the new estimate x_1 after first iteration is

a) $\frac{5}{11}$

b) $\frac{17}{11}$

c) $\frac{5}{12}$

d) $\frac{12}{17}$

(xxii)

In case of Newton Backward Interpolation Formula which equation is correct to find u?

a) $\frac{(x-x_n)}{h} = u$

b) $\frac{(x+x_n)}{h} = u$

c) $(x - x_n)h = u$

d) $(x - x_n) = u$

(xxiii)

Find $\Delta(x + cosx)$.

a) 1+2sin(x+1/2).sin1/2

b) 1 -2sin(x+1/2).sin1/2

c)

d)

$1 - 2\sin(x - 1/2).\sin 1/2$ $1 + 2\sin(x - 1/2).\sin 1/2$

(xxiv)

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

a) h^2

b) h^3

c) h^4

d) h^5

(xxv)

In Trapezoidal rule for finding $\int_a^b f(x)dx$, f(x) is approximated by

a) line segment

b) parabola

c) circular sector

d) None

(xxvi)

The truncation error in composite Simpson's one-third rule is of order

a) h^2

b) h^3

c) h^4

d) h^5

(xxvii)

Error in one step formula of Simpson's one-third rule in $\int_a^b f(x)dx$ is

a) $\frac{-h^5}{90} f^{iv}(c) a < c < b$

b) $\frac{-h^5}{90} f^{v}(c) a < c < b$

c) $\frac{-h^4}{90} f^{iv}(c) a < c < b$

d) $\frac{-h^3}{90} f''(c) a < c < b$

(xxviii)

Let $f(0) = 1.76, f(1) = 4.24$and then the Trapezoidal rule gives approximate value of $\int_0^1 f(x)dx$ is

a) 6

b) 3

c) 3.12

d) 3.98

(xxix)

In Trapezoidal rule if the interval of integration $\int_2^9 f(x)dx$ is divided into 7 equal sub-intervals then h=

a) 2

b) 0.5

c) 1

d) 1.5

(xxx)

Trapezoidal rule for finding the value of $\int_a^b f(x)dx$ there exists no error if f(x) is

a)

parabolic function

b)

linear function

c)

logarithmic function

d)

none of these.

(xxxi)

Trapezoidal rule for finding the approximate value of $\int_{212}^{719.8} K dx$ (K is a constant), the error of approximation is

a) 0

b)

10^{-2}

c)

-10^{-2}

d)

-10^{-4}

(xxxii)

In Simpson's one-third rule for finding $\int_a^b f(x)dx$, with n number of sub-intervals the number of parabolic areas that replace f(x) is

a) n

b) n-1

c) $\frac{n}{2}$

d) $\frac{n-1}{2}$

(xxxiii)

In Simpson's one-third rule if the interval of integration [a,b] is divided into four equal sub-intervals then $\int_a^b f(x)dx \cong$

a) $\frac{h}{3}(y_0 + 2y_1 + 2y_2 + 4y_3 + y_4)$

b) $\frac{h}{3}(y_0 + 4y_1 + 2y_2 + 4y_3 + y_4)$

c) $\frac{h}{3}(y_0 + 2y_1 + 4y_2 + 2y_3 + y_4)$

d) none.

(xxxiv)

When 0.1 is approximated to 0.09, the relative error is

a) 1/9

b) 0.11111

c) 0.11

d) none of these.

(xxxv)

Lagrange interpolation formula is used

a) near the beginning of the table

b) near the end of the table

c) in the middle point of the table

d) at all there

(xxxvi)

Which of the following statements applies to the Bisection method used?

a) convergence within a few iteration.

b) guaranteed to work for all continuous functions.

c) is faster than the Newton–Rapshon method

d) requires that there will be no error in determinating the sign of the function.

(xxxvii)

Simpson's rule for integration gives exact result when f(x) is a polynomial of degree

a) 1

b) 2

c) less than or equal to 3

d) 4

(xxxviii)

In Simpson's one third rule the curve y = f(x) is approximated as

a) straight line

b) second degree curve

c) third degree curve

d) fourth degree curve

(xxxix)

Which of the following does not always guarantee convergence?

a) Bisection method

b) Newton-Raphson method

c) Regula Falsi method

d) None of these.

(xl)

A transcendental equation may have

a) one root

b) two root

c) three root

d) infinite roots.

(xli) The number of significant figures in 0.03409 is

a) 5
b) 6
c) 7
d) 4

(xlii) The significant digit of 0.0001234 is

a) 7
b) 4
c) 8
d) 6

(xliii) Round-off error is a form of

a) truncation error
b) numerical error
c) inherent error
d) none of these.

(xliv) Round-off of the number 1.005723 up to three significant digits is

a) 1.00
b) 1.005
c) 1.01
d) none of these.

(xlv) After being rounded off to three significant figure the number 125.42 becomes

a) 125
b) 126
c) 125.42
d) none

(xlvi) When 9.8 is approximated to 9.79 the percentage error becomes

a) -0.01
b) 0.01
c) 0.00102145
d) 0.10204

(xlvii) The rate of convergence of Bisection method is
a) linear
b) quadratic
c) cubic
d) none of these.

(xlviii) Which of the following is an iterative method?
a) Gauss Elimination Method
b) Gauss Jordan Method
c) LU decomposition Method
d) Gauss-Seidel Method

(xlix) The convergence condition for Gauss-Seidel iterative method for solving a system of linear equation is
a) the co-efficient matrix is singular
b) the co-efficient matrix has rank zero
c) the co-efficient matrix must be strictly diagonally dominant.
d) none of these.

(l) Which of the following does not always guarantee convergence?
a) Bisection method
b) Newton-Raphson method
c) Regula -Falsi method
d) none of these.

(li) Bisection method is
a) conditionally and surely convergent
b) unconditionally and surely convergent
c) conditionally convergent
d) none of these.

(lii) Newton Raphson method is also known as
a) normal method
b) tangent method
c) parallel method
d) none of these.

(liii) Diagonal dominance is must for
a) Gauss-Seidel method
b) Gauss Elimination method

c) LU factorization method
d) All of these

(liv) In Newton's forward interpolation, the interval should be

a) equally spaced
b) not equally spaced
c) may be equally spaced
d) not (a) & (b)

(lv) Geometrically the Lagrange's interpolation formula for two points of interpolation represents a

a) parabola
b) circle
c) straight line
d) none of these.

(lvi) Newton's backward interpolation formula is used to interpolate

a) near end
b) near central position
c) near the beginning
d) none of these.

(lvii) The n-th order divided difference of a polynomial of degree n is

a) n
b) constant
c) zero
d) All of these.

(lviii) Which of the following is not correct?

a) Divided difference is linear
b) For equispaced arguments, the divided difference can be expressed in terms of backward differences.
c) Divided differences are symmetric functions.
d) Divided difference for equal argument is known as confluent divided differences

(lix) The degree of precision of Simpson's one-third rule is

a) 1
b) 2
c) 3
d) 5

(lx) Which of the following is not true?

a) Trapezoidal formula be a one point quadrature formula.

b) Simpson's one-third formula be a two point quadrature formula.

c) Simpson's three-eight formula be a three point quadrature formula.

d) none of these.

(lxi) In Trapezoidal rule if the length of each sub- interval is 0.5, when the interval of integration is [1,9], then number of sub-interval is

a) 8

b) 16

c) 18

d) 10

(lxii) Simpson's one-third rule can be applied if the number of equal sub-intervals of the interval of integration is

a) odd

b) even

c) any

d) none.

(lxiii)

If f(a) f(b) < 0 in bisection method after n iteration the root lies in the interval whose length is

a) <input type="image" src="/apttest/fck_image/135.PNG" width="61" height="37" />

b) <input type="image" src="/apttest/fck_image/135b.PNG" width="55" height="41" />

c) <input type="image" src="/apttest/fck_image/135c.PNG" width="65" height="44" />

d) none of these.

(lxiv) Method of false position is also known as

a)

method of tangent

b)

method of normal

c) method of chord

d) method of parabola

(lxv)

In direct iterative method we express f(x) = 0 into the form

a) $x = \varphi(x)$

b) $y = \varphi(x)$

c) $x = \varphi'(x)$

d) $x = \varphi''(x)$

(lxvi)

If f(x) is a continuous function and f(a) x f(b) < 0 then

a) there is exactly one root in (a, b)

b) there lies odd number of real roots in (a, b)

c) f(x) has odd number of roots

d) none of these

(lxvii)

Gauss elimination method fails even if one of the pivot elements is equal to.......

a) 0

b) 1

c) 2

d) 3

(lxviii)

Matrix inversion method fails to solve a system of equations if determinant value of the co-efficient matrix is ....

a) 0
b) 1
c) 2
d) 3

(lxix)

Backward substitution method is used to solve a system of equations by ....

a) Gauss elimination method
b) Gauss Jordan method
c) Matrix factorization method
d) None of these.

(lxx)

Gauss elimination method is

a) an iterative method
b) non-iterative method
c) a diagonal method
d) matrix inversion method