B. L. D. E. Association's

S. B. ARTS & K. C. P. SCIENCE COLLEGE, VIJAYAPUR

1st INTERNAL TEST 2023-2024

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Subject/ವಿಷಯ : Maths Semester/ಸೆಮಿಸ್ಟರ್ : Vth Exam Seat No / ಪರೀಕ್ಷೆ ಸ್ಥಳಾಂಕ : S2028740

Invigilator's Signature / ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರ ಸಹಿ Signature of Evaluator / ಪರೀಕ್ಷಕರ ಸಹಿ Marks obtained/ ಪಡೆದ ಅಂಕಗಳು 04/04

part – A

20/20

Q. No.1 :-

3) $\sqrt[3]{24}$ $x_0 = 2.8$

Newton – Raphson Method

$$x_{n+1} = x_n - \frac{f(x_0)}{f'(x_0)}$$

$$f(x) = \sqrt[3]{24}$$
$$x^3 = 24$$
$$f(x) = x^3 - 24$$
$$f'(x) = 3x^2$$

$n = 0$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$= 2.8 - \frac{[(2.8)^3 - 24]}{3(2.8)^2}$$

$$= 2.8 - \frac{(21.952 - 24)}{23.52}$$

2

$$= \frac{2.8 + 2.048}{23.52}$$

$$x_1 = 2.88707$$

$$\boxed{x_1 = 2.88707}$$

5] Order :-

$$\text{order} = \frac{\text{Largest argument} - \text{Smallest argument}}{\text{unit of Increment}}$$

2

degree: degree is defined as the higher power value of 'y' is known as degree of difference

6] $y_{n+2} - y_{n+1} + y_n = 2$

Given Eq^n above
highest argument is $n+2$
Smallest argument is n
unit of Increment is 1

2

$$\text{order} = \frac{\text{Largest argument} - \text{Smallest argument}}{\text{unit of Increment}}$$

$$= \frac{(n+2) - (n)}{1}$$

$$= \frac{\cancel{n}+2-\cancel{n}}{1}$$

$$\boxed{\text{order} = 2}$$

//

Part - B

Q. No. 2

2) $10x + 2y + z = 9$

$2x + 20y - 2z = -44$

$-2x + 3y + 10z = 22$

$\rightarrow$ $x = \frac{1}{10}[9 - 2y - z]$

$y = \frac{1}{20}[-44 - 2x + 2z]$

$z = \frac{1}{10}[22 + 2x - 3y]$

Initial Approximate Values

$x^0 = (x^0, y^0, z^0) = (0, 0, 0)$

1st Iteration

$x_1 = \frac{1}{10}[9 - 2(y^0) - z^0] = \frac{1}{10}[9 - 2(0) - 0] = \frac{9}{10} = 0.9$

$y_1 = \frac{1}{20}[-44 - 2x^1 - 2z^0] = \frac{1}{20}[-44 - 2 \times 0.9 - 2(0)]$

$= \frac{1}{20}[-45.8] = -2.29$

$z_1 = \frac{1}{10}[22 + 2x^1 - 3y^1] = 1.693$

2nd Iteration

$x_2 = \frac{1}{10}[9 - 2y^1 - z^1] = 0.2727$

$y_2 = \frac{1}{20}[-44 - 2(x^2) + 2z^1] = -2.05797$

$z_2 = \frac{1}{10}[22 + 2x^2 - 3y^2] = 2.8719$

3^{rd} Iteration

$x_3 = \frac{1}{10}[9 - 2y^2 - z^2] = 1.024404$

$y_3 = \frac{1}{20}[-44 - 2x^3 + 2z^2] = -2.0152504$

$z_3 = \frac{1}{10}[22 + 2x^3 - 3y^3] = 3.0094$

$x_4 = \frac{1}{10}[9 - 2y^3 - z^3] = 1.0021$

4^{th} Iteration

$y_4 = \frac{1}{20}[-44 - 2x^4 + 2z^3] = -1.99927$

$z_4 = \frac{1}{10}[22 + 2x^4 - 3y^4] = 3.00020$

$\cancel{x_5 = \frac{1}{10}[9 - 2y^4 - z^4] = 0.9999}$

$\cancel{y_5 = \frac{1}{20}[44 - 2(x^5) + 2z^4]} =$

The values of Gauss-Siedel method

$$\boxed{\begin{aligned} x &= 1 \\ y &= -2 \\ z &= -3 \end{aligned}}$$

//

part – C

2] $y_n = a2^n + b3^n$

$y_{n+1} = a2^{n+1} + b3^{n+1}$

$y_{n+2} = a2^{n+2} + b3^{n+2}$

$$\begin{vmatrix} y_n & \cancel{a}2^n & 3^n \\ y_{n+1} & \cancel{a}2^{n+1} & 3^{n+1} \\ y_{n+2} & \cancel{a}\cdot 2^{n+2} & 3^{n+2} \end{vmatrix} = 0$$

$$\begin{vmatrix} y_n & 2^n & 3^n \\ y_{n+1} & 2^n \cdot 2^1 & 3^n \cdot 3^1 \\ y_{n+2} & 2^n \cdot 2^2 & 3^n \cdot 3^2 \end{vmatrix} = 0$$

5

$$\begin{vmatrix} y_n & 2^n & 3^n \\ y_{n+1} & 2^n \cdot 2 & 3^n \cdot 3 \\ y_{n+2} & 2^n \cdot 4 & 3^n \cdot 9 \end{vmatrix} = 0$$

$C_2 \longrightarrow \frac{C_2}{2^n}$

$C_3 \longrightarrow \frac{C_3}{3^n}$

$$\begin{vmatrix} y_n & 1 & 1 \\ y_{n+1} & 2 & 3 \\ y_{n+2} & 4 & 9 \end{vmatrix} = 0$$

$y_n(18-12) - y_{n+1}(9-4) + y_{n+2}(3-2) = 0$

$y_n 6 - 5y_{n+1} + y_{n+2} = 0$

$$\boxed{y_{n+2} - 5y_{n+1} + 6y_n = 0}$$

Q.No.1:

2) Iteration Method.

$f(x) = 0$ be a given Equation
It is Equation Interms of
$x = \phi(x)$

Let $x = x_0$ be the Initial approximation

The first & Sucessive Approximation

$x_1 = \phi(x_0)$

$x_2 = \phi(x_1)$

$\vdots \qquad \vdots$

$x_{n+1} = \phi(x_n)$

$x_{n+1} = \phi(x_n)$ is Convergent

if $|\phi'(x_0)| < 1$

i.e $|\phi'(x_0)|_{x=x_0} < 1$ //

Hence proved Iteration Method.

1) Bisection Method.

Let $f(x)$ be a continuous function on $[a,b]$ and $f(a)$ & $f(b)$ to opposite sign such that $f(a), f(b) < 0$.

x_0 be initial approximation in interval $[a,b]$

$$x_0 = \frac{a+b}{2}$$

Let x_1 be the ~~unit~~ initial approximation ~~[a,b]~~ of on $[a, x_0]$,

& $f(a), f(b) < 0$

$$x_1 = \frac{a+x_0}{2}$$

or x_2 be the initial approximation of the x_0, b

$f(a), f(b) < 0$

$$x_2 = \frac{x_0+b}{2}$$

This process is ~~cont~~ continue until the desired accuracy.

4) Taylor's Series Method.

→ The Taylor's series expansion at point x_0 to the $y(x_0) = y_0$

$$y(x) = y(x_0) + \frac{(x-x_0)f'(x_0)}{1!} + \frac{(x-x_0)f''(x_0)}{2!} + \frac{(x-x_0)f'''(x_0)}{3!}$$

$$+ \frac{(x-x_0)f^{IV}(x_0)}{4!} + \ldots\ldots$$

Let $y(x_0), y'(x_0), y''(x_0), y'''(x_0)$ be the difference eqn of the $y(x)$.

M1

Ist Internal

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S. B. ARTS & K. C. P. SCIENCE COLLEGE, VIJAYAPUR

Ist INTERNAL TEST 2022-2023

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Subject/ವಿಷಯ: Mathimatics - I Semester/ಸೆಮಿಸ್ಟರ್: 6th Exam Seat No./ಪರೀಕ್ಷೆ ಸ್ಥಳಾಂಕ: 52028609

Invigilator's Signature/ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರ ಸಹಿ Signature of Evaluator/ಪರೀಕ್ಷಕರ ಸಹಿ Marks obtained/ಪಡೆದ ಅಂಕಗಳು 03/04

Q. No. 2

1) necessary condition for a function f(z) to be analytic

Statement: The necessary condition of $f(z) = u(x,y) + iv(x,y)$ be an analytic Domain D The first order derivative u & v with r.to x & y & must have satify the C-R equation.

proof: $f(z) = u(x,y) + iv(x,y)$ be an analytic Domain D.

Definition of Differential equation

$$f'(z) = \lim_{\delta z \to 0} \frac{f(z+\delta z) - f(z)}{\delta z} \quad \text{——} (1)$$

05

$$f(z) = u(x,y) + iv(x,y)$$
$$f(z+\delta z) = u(x+\delta x, y+\delta y) + iv(x+\delta x, y+\delta y).$$
$$z = x+iy$$
$$\delta z = \delta x + i\delta y.$$

$$f'(z) = \lim_{\delta z \to 0} \frac{u(x+\delta x, y+\delta y) + iv(x+\delta x, y+\delta y) - u(x,y) - iv(x,y)}{\delta x + i\delta y}$$

$$= \lim_{\delta z \to 0} \frac{u(x+\delta x, y+\delta y) - u(x,y) + iv(x+\delta x, y+\delta y) - iv(x,y)}{\delta x + i\delta y}$$

$$= \lim_{\delta z \to 0} \left[\frac{u(x+\delta x, y+\delta y) - u(x,y)}{\delta x + i\delta y}\right] - i\left[\frac{v(x+\delta x, y+\delta y) - v(x,y)}{\delta x + i\delta y}\right]$$

$$\text{——} (2)$$

(i) δz is whole real

$$\delta z = \delta x \qquad \delta y = 0.$$

eqn (2) becomes.

$$= \lim_{\delta z \to 0} \left[\frac{u(x+\delta x, y) - u(x, y)}{\delta x} \right] + i \left[\frac{v(x+\delta x, y) - v(x, y)}{\delta x} \right]$$

$$= \frac{\partial u}{\partial x} + i \frac{\partial v}{\partial x} \quad \text{--- (3)}$$

(2) δz is whole imaginary

$$\delta z = i\delta y \qquad \delta x = 0$$

$$= \lim_{\delta z \to 0} \left[\frac{u(x, y+\delta y) - u(x, y)}{i\delta y} \right] + i \left[\frac{v(x, y+\delta y) - v(x, y)}{i\delta y} \right]$$

$$= \frac{1}{i} \frac{\partial u}{\partial y} + \frac{\partial v}{\partial y} \quad \text{--- (4)}$$

eqn (3) & (4)

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial x} = \frac{1}{i} \frac{\partial u}{\partial y} + \frac{\partial v}{\partial y}$$

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial x} = \frac{\partial v}{\partial y} - i \frac{\partial u}{\partial y}$$

$$\frac{\partial u}{\partial x} = \frac{\partial u}{\partial y} \qquad \frac{\partial v}{\partial x} = -\frac{\partial u}{\partial y} \qquad \& \qquad \frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$$

Hence the proof

Q. No. 3

1] Statement : non empty subset S of a ring is a subring of iff $a \in S$ $b \in S$ then

a) $a - b \in S$

b) $ab \in S$

proof : Let S be a subring of Ring R
S is ring by itself

$\Rightarrow a \in S \quad b \in S$
$-b \in S$
$\Rightarrow a + (-b) \in S$
$a - b \in S$

$a \in S \quad b \in S$
$ab \in S$

~~proof~~ :- non empty
conversly : The non empty subset S of a ring is a subring

$a \in S \quad b \in S$
$-b \in S$
$a + (-b) \in S$
$a - b \in S$

$a \in S \quad b \in S$
$ab \in S$

proof : The non empty subset S of a ring is a subring

S is a abelian

PTO

1] clousia law

$a \in S \quad b \in S$

$-b \in S$

$a + (-b) \in S$

$a - b \in S$

It is closed.

2] associative law.

The ~~SCa~~ ~~SCO~~ SCa associative law holds R.

∴ associative law holds

3] Existance of Identity

$a \in S$ & $-a \in S$

$a - a \in S$

$0 \in S$

∴ Existance of identity.

4] Existance of inverse

$0 \in S \quad a \in S$

$0 - a \in S$

$-a \in S$

5] commutative law.

The SCa commutative law holds in R

∴ The commutative law holds in S

II S is a semi

1] clouser law

$ab \in S \quad ab \in S$

$ab - ab \in S$

$0 \in S$

∴ it is clouser law

2] associative law.

The sca The associative law holds in R

∴ The associative law holds in S

3] distrabution law.

The distrcution law holds in R

∴ The distraubution low holds in S

∴ S be a subring of ring R

S is ring by itself.

Hence the proof

Q-NO-I

1] analytic function with constant real part is constant

$u = c$

$\frac{\partial u}{\partial x} = 0 \quad \frac{\partial u}{\partial y} = 0$

~~C-R equation~~ $f'(z) = \frac{\partial u}{\partial x} + \frac{\partial v}{\partial x}$

$\cancel{\frac{\partial u}{\partial x} = \frac{\partial u}{\partial y}}$

C-R equation

$\frac{\partial u}{\partial x} = \frac{\partial u}{\partial y}$

$\cancel{\frac{\partial x}{\partial x}}$ =

$\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$

$f'(z) = \frac{\partial u}{\partial y} - \frac{\partial u}{\partial y}$

$f'(z) = 0$

both side integration

$f'(z) = c$

2] $f(z) = xy + iy$

$\cancel{u+iv} =$

$f(z) = u + iv$

$f(z) = \cancel{u}\, xy + iy$

$u = xy \qquad v = y$

$\frac{\partial u}{\partial x} = y \qquad \frac{\partial v}{\partial x} = 0$

$\frac{\partial u}{\partial y} = x \qquad \frac{\partial v}{\partial y} = 1$

2 C-R eqn

$\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y} \qquad \frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$

$y = 1 \qquad x = -0$

$f(z)$ is not analytic.

4] i] $a(b-c) = ab - ac$

$a(b-c) = ab + a(-c)$

$= ab + (-ac)$

$a(b-c) = ab - ac$

ii] $(b-c)a = ba - ca$

$= (b-c)a$

$= [b-(-c)]a$

$= ba + a(-c)$

$= ba + (-ac)$

$= ba - ac$

$(b-c)a = ba - ac$

5] Integral domain
The domain is defined by ~~the~~ a non empty set of ring R (I, (2 . + . .) is called integral domain

Division ring
The Division ring defined by the atleast said to two division is called division ring