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RAN-2103000203023002

B. Sc. (Sem. - III) Examination

March - 2023

Mathematics - VI : MTH - 302

[Total Marks: 50

સૂચના : / Instructions

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of ☛ signs on your answer book

Name of the Examination:

☛ **B. Sc. (Sem. - III)**

Name of the Subject :

☛ **Mathematics - VI : MTH - 302**

Subject Code No.: **2103000203023002**

Seat No.:

Student's Signature

(2) *The question paper has **Two** sections and **33** questions in all.*

(3) ***Que. 1 to 16 are of One mark each and Que. 17 to 33 are of Two marks each.***

(4) *All sections and questions are compulsory.*

(5) *Follow **usual** notations.*

(6) *Use of non-programmable calculator is allowed.*

***O.M.R. Sheet* ભરવા અંગેની અગત્યની સૂચનાઓ આપેલ**
***O.M.R. Sheet*ની પાછળ છાપેલ છે.**
Important instructions to fillup O.M.R. Sheet
are given on back side of the provided O.M.R. Sheet.

Section A (16 Questions) (Total 16 Marks)
(Each question carries ONE mark)

Q. (1) The root of the equation $x^3 - x - 2 = 0$ lies within the interval

(a) (0, 1) (c) (1, 2)

(b) (–1, 0) (d) Root does not exist

Q. (2) The Newton-Raphson's method cannot be applied if

(a) $f'(x)$ is too large (c) $f'(x)$ is negative

(b) $f'(x) = 0$ (d) None of these

Q. (3) The method of false-position is also known as

(a) Method of bisection (c) Method of tangents

(b) Regula-falsi method (d) Method of chords

Q. (4) $E - \Delta =$ _____.

(a) 1 (c) ∇

(b) $E\delta$ (d) None of these

Q. (5) $\Delta y_3 =$ _____.

(a) ∇y_1 (c) ∇y_3

(b) ∇y_2 (d) None of these

Q. (6) $\Delta f(x) =$ _____, where $f(x) = c$ (*constant*).

(a) $f(x + c) - f(x)$ (c) $cf(1)$

(b) $f(c + h) - f(c)$ (d) 0

Q. (7) Which of the following is true?

(a) $\log_e E = \frac{1}{h} D$ (c) $h \log_e E = D$

(b) $\log_e E = hD$ (d) None of these

Q. (8) μ is known as

(a) An average operator
(c) A shift operator
(b) A central operator
(d) None of these

Q. (9) The process of finding the values within the interval (x_0, x_n) is called

(a) Interpolation method
(c) Iterative method
(b) Extrapolation method
(d) None of these

Q. (10) If (0, 12), (1, 14) and (2, 16) then $\Delta^2 y_0$ = _____.

(a) 12
(c) 0.2
(b) 0
(d) None of these

Q. (11) Which of the following is true?

(a) $\nabla y_n = y_n - y_{n+1}$
(c) $\nabla y_n = y_n + y_{n-1}$
(b) $\nabla y_n = y_{n+1} - y_n$
(d) $\nabla y_n = y_n - y_{n-1}$

Q. (12) E_R = _____.

(a) $\frac{E_P}{X}$
(c) $\frac{\delta X}{X} \times 100$
(b) $\frac{E_A}{X}$
(d) None of these

Q. (13) The root of the equation $e^x = 4 + x$ lies within the interval

(a) (1, 2)
(c) (–1, 0)
(b) (0, 1)
(d) None of these

Q. (14) An absolute error is defined by

(a) $E_R - E_P$
(c) $\frac{X}{X_1}$
(b) $E_A - E_R$
(d) $|X - X_1|$

Q. (15) Round off 5.001500 correct to 4 significant figures.

(a) 5.002 (c) 0.0015

(b) 5.001 (d) None of these

Q. (16) If we want to solve $x^2 - 7 = 0$ using Newton-Raphson method and the initial point is $x_0 = 2.5$, then the subsequent estimate of x (i.e. x_1) will be

(a) 2.65 (c) 2.25

(b) 2.55 (d) None of these

Section B (17 Questions) (Total 34 Marks)

(Each question carries TWO marks)

Q. (17) If two numbers are given as 2.5 and 48.289, both of which being correct to the significant figures given, then their product is _____.

(a) 0.12×10^2 (c) 12×10^2

(b) 1.2×10^2 (d) None of these

Q. (18) If we apply bisection method to solve the equation $x^3 - x - 2 = 0$, then the third iteration x_2 = _____.

(a) 1.625 (c) 1.5

(b) 1.75 (d) None of these

Q. (19) When we express the equation $f(x) = 0$ in the form $x = \phi(x)$ for iteration method, then $\phi(x)$ must be such that

(a) $|\phi'(x)| < 1$ (c) $|\phi'(x)| = 1$

(b) $|\phi'(x)| > 1$ (d) None of these

Q. (20) One of the real roots of the equation $x^3 - 3x - 3 = 0$ lies in _____.

(a) (0, 1) (c) (–1, 0)

(b) (1, 2) (d) (2, 3)

Q. (21) Newton-Raphson formula to solve the equation $x = e^{-x}$ is _____.

(a) $x_{n+1} = x_n + \frac{x_n - e^{-x_n}}{1 + e^{-x_n}}$

(b) $x_{n+1} = x_n - \frac{x_n - e^{-x_n}}{1 + e^{-x_n}}$

(c) $x_{n+1} = \frac{1 + x_n}{1 + e^{x_n}}$

(d) None of these

Q. (22) Guass's Backward interpolation formula is _____

(a) $y(x) = y_0 + p\Delta y_{-1} + \frac{p(p+1)}{2!}\Delta^2 y_{-1} + \frac{(p+1)\,p(p-1)}{3!}\Delta^3 y_{-2} + \frac{(p+2)(p+1)\,p(p-1)}{4!}\Delta^4 y_{-2} + ...$

(b) $y(x) = y_0 + p\Delta y_{-1} + \frac{p(p+1)}{2!}\Delta^2 y_{-2} + \frac{(p+1)\,p(p-1)}{3!}\Delta^3 y_{-2} + \frac{(p+2)(p+1)\,p(p-1)}{4!}\Delta^4 y_{-3} + ...$

(c) $y(x) = y_0 + p\Delta y_{-1} + \frac{p(p-1)}{2!}\Delta^2 y_{-1} + \frac{(p+1)\,p(p-1)}{3!}\Delta^3 y_{-2} + \frac{(p+1)p\,(p-1)\,(p-2)}{4!}\Delta^4 y_{-2} + ...$

(d) $y(x) = y_0 + p\Delta y_{-1} + \frac{p(p-1)}{2!}\Delta^2 y_{-2} + \frac{(p+1)\,p(p-1)}{3!}\Delta^3 y_{-2} + \frac{(p+1)\,p(p-1)(p-2)}{4!}\Delta^4 y_{-3} + ...$

Q. (23) If (0, 0.22), (1, 0.65), (2, 1.01) and (3, 1.62), then $\Delta^3 y_0$ = _____.

(a) 0.32

(b) 0.43

(c) -0.07

(d) None of these

Q. (24) For the Newton's backward difference interpolation formula, which of the following is true?

(a) $x_n = x_0 - ph$

(b) $x = x_0 + ph$

(c) $x_0 = x - ph$

(d) $x = x_n + ph$

Q. (25) For the following data, to find $y(2)$ using Newton's forward difference interpolation formula, $p =$ _____.

x	1	3	5	7
$y(x)$	24	120	336	720

(a) 0.05 (c) -0.5

(b) 0.5 (d) -0.05

Q. (26) $\Delta[f(x)] =$ _____.

(a) $\dfrac{\Delta[f(x)]}{f(x)f(x+h)}$ (c) $-\dfrac{\Delta[f(x)]}{f(x)f(x+h)}$

(b) $-\dfrac{\Delta[f(x)]}{f(x)f(x-h)}$ (d) 0

Q. (27) $\dfrac{(\Delta+\nabla)}{2} =$ _____.

(a) δ^{-1} (c) $\mu\delta$

(b) $E\mu$ (d) None of these

Q. (28) $\Delta^2 x^3 =$ _____ , $(h = 1)$

(a) $6(1 + x)$ (c) $6(2 + x)$

(b) $6(1 - x)$ (d) None of these

Q. (29) $\nabla(e^{ax}) =$ _____ ; $h = 1$.

(a) $e^{a(x-1)}(e - 1)$ (c) $e^{a(x-1)}(e^a - 1)$

(b) $e^{a(x+2)}(e - 1)$ (d) None of these

Q. (30) $\Delta^2 y_n =$ _____.

(a) $(E - 1)^2 y_n$ (c) $(E^2 - 2E - 1)y_n$

(b) $(E + 1)^2 y_n$ (d) None of these

Q. (31) If $X = 0.51$ and is correct to 2 decimal places, then the percentage accuracy is _____.

(a) 0.98%

(b) 98%

(c) 9.8%

(d) None of these

Q. (32) The relative error in the sum of the numbers 1.732, 2.236 and 2.646 to four significant digits is _____.

(a) 0.15

(b) 0.005

(c) 0.015

(d) 0.0015

Q. (33) An absolute error in the quotient $\frac{a}{b}$ is given by _____.

(a) $\frac{a}{b}\left(\frac{E_A^1}{a} - \frac{E_A^2}{b}\right)$

(b) $\frac{b}{a}\left(\frac{E_A^1}{a} - \frac{E_A^2}{b}\right)$

(c) $\frac{a}{b}\left(\frac{E_A^1}{b} - \frac{E_A^2}{a}\right)$

(d) $\frac{b}{a}\left(\frac{E_A^1}{b} - \frac{E_A^2}{a}\right)$

_____

SPACE FOR ROUGH WORK