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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) μ is known as

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

Q. (2) The process of finding the values within the interval (x_0, x_n) is called

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

Q. (3) If (0, 12), (1, 14) and (2, 16) then $\Delta^2 y_0$ = _____.

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

Q. (4) Which of the following is true?

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

Q. (5) E_R = _____.

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

Q. (6) The root of the equation $e^x = 4 + x$ lies within the interval

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

Q. (7) An absolute error is defined by

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

Q. (8) Round off 5.001500 correct to 4 significant figures.

(a) 5.002
(b) 5.001
(c) 0.0015
(d) None of these

Q. (9) 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

Q. (10) 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. (11) 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. (12) 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. (13) $E - \Delta =$ _____.

(a) 1 (c) ∇

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

Q. (14) $\Delta y_3 =$ _____.

(a) ∇y_1 (c) ∇y_3

(b) ∇y_2 (d) None of these

Q. (15) $\Delta f(x) =$ _____, where $f(x) = c$ (*constant*).

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

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

Q. (16) Which of the following is true?

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

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

Section B (17 Questions) (Total 34 Marks)

(Each question carries TWO marks)

Q. (17) One of the real roots of the equation $x^3 - 3x - 3 = 0$ lies in _____.

(a) (0, 1)

(b) (1, 2)

(c) (–1, 0)

(d) (2, 3)

Q. (18) 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. (19) Guass's Backward interpolation formula is _____

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

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

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

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

Q. (20) If (0, 0.22), (1, 0.65), (2, 1.01) and (3, 1.62), then $\Delta^3 y_0$ = _____.

(a) 0.32 (c) -0.07

(b) 0.43 (d) None of these

Q. (21) For the Newton's backward difference interpolation formula, which of the following is true?

(a) $x_n = x_0 - ph$ (c) $x_0 = x - ph$

(b) $x = x_0 + ph$ (d) $x = x_n + ph$

Q. (22) 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. (23) $\Delta[f(x)]$ = _____.

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

(a) δ^{-1} (c) $\mu\delta$

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

Q. (25) $\Delta^2 x^3$ = _____ , $(h = 1)$

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

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

Q. (26) $\nabla(e^{ax}) =$ _____ ; $h = 1$.

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

(b) $e^{a(x+2)}(e-1)$

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

(d) None of these

Q. (27) $\Delta^2 y_n =$ _____.

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

(b) $(E+1)^2 y_n$

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

(d) None of these

Q. (28) 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. (29) 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. (30) 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) $\frac{b}{a}\left(\frac{E_A^1}{b} - \frac{E_A^2}{a}\right)$

Q. (31) 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

(b) 1.2×10^2

(c) 12×10^2

(d) None of these

Q. (32) 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. (33) 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

_____

SPACE FOR ROUGH WORK