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RAN-1903000203040056

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S. Y. B. Sc. (A.T.K.T.) (Sem. - III) Examination

March - 2023

Mathematics

Mathematical Methods (GE)

Time: 2 Hours] **[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:

☛ **S. Y. B. Sc. (A.T.K.T.) (Sem. - III)**

Name of the Subject :

☛ **Mathematics - Mathematical Methods (GE)**

Subject Code No.: **1903000203040056**

Seat No.:

Student's Signature

(2) All questions are compulsory.

(3) Q. 1 to 16 Multiple Choice question Each carry 1 Mark.

(4) Q. 17 to 33 Multiple Choice question Each carry 2 Marks.

***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.

Q. 1. Which of the following relation is false

(A) $\delta = \nabla E^{1/2}$ (B) $\mu = \frac{1}{2}(E^{1/2} - E^{-\frac{1}{2}})$

(C) $E^{-1} = I - \nabla$ (D) $\delta = E^{-1/2}\,\Delta$

Q. 2. If $f(x) = Cos\,x$, $h = \pi/2$ then $Ef(x)$

(A) $Sin\,x$ (B) $-Cos\,x$

(C) $-Sin\,x$ (D) $Cos\,x$

Q. 3. If roots of auxiliary equation of a difference equation are 1 and 2, its CF is

(A) $c_1 + c_2 2^k$ (B) $c_1 c_2 2^k$

(C) $c_1 + c_2 k$ (D) $c_1 + c_2$

Q. 4. $\Delta x^{(3)} =$

(A) $x^{(2)}$ (B) $3x^{(2)}$

(C) $3x^2$ (D) $x^{(3)} - x^{(2)}$

Q. 5. If $f(x) = x^2 + 3x + 3$ is expressed in to factorial notation $ax^{(2)} + bx^{(1)} + c$ then value of the constant c is

(A) 3 (B) 0

(C) 2 (D) 1

Q. 6. $\Delta\left(\frac{1}{x}\right) =$ _____ , $h = 1$

(A) $-\frac{1}{x(x+1)}$ (B) $\frac{1}{x(x+1)}$

(C) $\frac{x+1}{x}$ (D) $\frac{x-1}{x}$

Q. 7. $\mu Y_{1/2} =$

(A) $\frac{1}{2}(Y_1 - Y_0)$ (B) $\frac{1}{2}(Y_1 + Y_0)$

(C) $(Y_1 - Y_0)$ (D) $\frac{1}{2}(Y_{1/2} - Y_{-1/2})$

Q. 8. If $\Delta^n x^{(m)} = 0$ then

(A) $n < m$ (B) $n \leq m$

(C) $n \geq m$ (D) $n > m$

Q. 9. Opearator Δ is equivalent to

(A) ΔE (B) δE

(C) ∇E (D) δE^{-1}

Q. 10. $\Delta^5 x^4 =$

(A) 0 (B) $20\,x^3$

(C) 20 (D) $4\,x^3$

Q. 11. $\nabla Y_5 =$

(A) ΔY_3 (B) ΔY_4

(C) δY_4 (D) ΔY_5

Q. 12. Degree of $y^5_{x+3} - 7y^2_{x+2} - 2y_{x-1} = 0$

(A) 5 (B) 3

(C) 2 (D) 4

Q. 13. $\delta^{k/2} Y_r =$

(A) $\nabla^{k/2} Y_{r+1/2}$ (B) $\nabla^{k/2} Y_{r-1/2}$

(C) $\nabla^{k/2} Y_{r/2}$ (D) $\Delta^{k/2} Y_{r+1/2}$

Q. 14. A curve Y passes through the points (1, –3) and (3, –5) then $\nabla Y_1 =$

(A) –5 (B) –3

(C) –2 (D) 2

Q. 15. If $f(x) = k$ is a constant function then $\Delta f(x)$ is

(A) 1 (B) 0

(C) k (D) 2

Q. 16. Which of the following relation between ∇ and E is true

(A) $E = \nabla - \mathrm{I}$ (B) $E = I - \nabla$

(C) $E^{-1} = \mathrm{I} - \nabla$ (D) $E^{-1} = \nabla$

Q. 17. Particular Integral of $y_{k+3} + y_{k+2} + 3y_k = 2^k$ is $y =$ _____.

(A) $2^{k/15}$ (B) $2k$

(C) $2^k/15$ (D) $k/15$

Q. 18. $\Delta \log Y_x =$ _____ , $h = 1$

(A) $\log\left(1 - \frac{Y_{x+1}}{Y_x}\right)$ (B) $\log\left(\frac{Y_{x+1}}{Y_x} + 1\right)$

(C) $\log\left(1 + \frac{\Delta Y_x}{Y_x}\right)$ (D) $\log\left(\frac{Y_{x+1}}{Y_x} - 1\right)$

Q. 19. If $f(x) = 2x^2 - 3x + 1$, then its factorial expression is

(A) $2x^{(2)} - x^{(1)} + 1$ (B) $2x^{(2)} + x^{(1)} + 1$

(C) $2x^{(2)} - 3x^{(1)} + 1$ (D) $2x^{(2)} - x^{(1)} - 1$

Q. 20. Order and degree of the difference equation $(y_{x+3})^4 + 2\,y_{x+2} - 6y_x = 0$ is ____.

(A) 3, 4 (B) 0, 4

(C) 4, 3 (D) 2, 4

Q. 21. If two roots of auxiliary equation of a difference equation are repeated then its complentary function is

(A) $(c_1 + c_2)\,ka^x$ (B) $(c_1 + c_2 k)\,a^k$

(C) $(c_1 + c_2 k)\,k^a$ (D) $(c_1 - c_2 k)\,k^x$

Q. 22. $x^{(-1)} =$ _____ $h = 1$

(A) $\frac{x}{x+1}$ (B) $\frac{x+1}{2}$

(C) $\frac{x+1}{x}$ (D) $\frac{1}{x+1}$

Q. 23. $\Delta^2(x+1)^2 =$ _____ $h = 1$

(A) 2 (B) $2x + 2$

(C) $2x$ (D) $2x + 1$

Q. 24. General solution of $y_{k+3} - 3y_{k+2} + 3y_{k+1} - y_k = 0$

(A) $c_1 c_2 c_3 k^3$ (B) $c_1 x + c_2 k^2 + c_3 k^3$

(C) $(c_1 + c_2 + c_3)\,k$ (D) $c_1 + c_2 k + c_3 k^2$

Q. 25. $\left(\frac{\Delta}{E}\right)x =$ $h = 1$

(A) x (B) 1

(C) 2 (D) 0

Q. 26. $\Delta^2 e^{-2x} =$ _____ , $h = 1$

(A) $e^{-2x}(e^{-2} - 1)^2$ (B) $e^{-2x}(e^{-2} + 1)^2$

(C) $e^{2x}(e^{-2} + 1)^2$ (D) $e^{-2x}(e^{-2x} + 1)^2$

Q. 27. Which of the following relation is correct

(A) $\mu = \sqrt{1 - \delta^2/4}$ (B) $\mu = \sqrt{1 + \delta^2/4}$

(C) $\mu = \sqrt{1 + \delta^2}$ (D) $\mu = 1 + \delta^2/4$

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

(A) 12 (B) 6

(C) 18 (D) 36

Q. 29. $\delta^2 E =$

(A) Δ^2 (B) ∇^2

(C) Δ (D) ∇

Q. 30. If $\Delta y = x^2 + x + 3$ then $\Delta^2 y =$ _____ , $h = 1$

(A) $2x$ (B) $2x + 2$

(C) 2 (D) 0

Q. 31. Order and degree of $y^4_{x+5} - 3y^2_{x+2} - 7y_{x-1} = 0$

(A) 4, 5 (B) 4, 6

(C) 6, 4 (D) 4, 2

Q. 32. General solution of $y_{x+2} + y_x = 0$ is $y =$ _____.

(A) $Cos(C_1 + kC_2)$ (B) $C_1 Cos(kC_2)$

(C) $Cos(k\pi/2 + C_2)$ (D) $C_1 Cos(k\pi/2 + C_2)$

Q. 33. If $Y = a_0 + a_1 x + a_2 x^2 +$ _____ $+ a_n x^n$, h = length of interval then $\Delta^n Y =$ _____.

(A) $a_n n! h^n$ (B) $n! h^n$

(C) $a_n n!$ (D) $a_n n! h$

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SPACE FOR ROUGH WORK