

1903000203040056
EXAMINATION FEBRUARY-MARCH 2024
BACHELOR OF SCIENCE (THIRD SEMESTER)
MATHEMATICAL METHODS - LEVEL 4

[Time: As Per Schedule]

[Max. Marks: 50]

Instructions:

1. Fill up strictly the following details on your answer book

a. Name of the Examination: **BACHELOR OF SCIENCE (THIRD SEMESTER)**

b. Name of the Subject: **MATHEMATICAL METHODS LEVEL 4**

c. Subject Code No: **1903000203040056**

2. Sketch neat and labelled diagram wherever necessary.
3. Figures to the right indicate full marks of the question.
4. All questions are compulsory.
5. Follow usual notations
6. Use of non-programmable calculator is allowed.

Seat No:

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Student's Signature

Q.1 Answer any four of the following:

8

1. Given that

X	1	2	3	4	5
Y	2	5	10	17	26

Find the values of $\nabla^2 y_5$, and $\nabla^3 y_4$.

2. Prove that $\delta^2 \equiv \Delta \nabla$.
3. If $y = 3x + 5$, find the difference equation.
4. Find the solution of $y_{x+2} = 2y_x$
5. Find the value of $\Delta \{2x^{(3)} - 3x^{(2)} + 3x^{(1)} - 10\}$
6. Find the function $f(x)$ whose first forward difference is e^x .

Q.2 Answer any two of the following:**14**

1. Obtain the estimates of missing terms in the following table:

x	1	2	3	4	5	6	7	8
y	2	4	8	?	32	?	128	256

2. 1) Prove that $(1 + \Delta)(1 - \nabla) = 1$

2) In usual notation prove that

$$e^x \left(u_0 + x\Delta u_0 + \frac{x^2}{2!} \Delta^2 u_0 + \frac{x^3}{3!} \Delta^3 u_0 \dots \right) = u_0 + \frac{u_1 x}{1!} + \frac{u_2 x^2}{2!} + \frac{u_3 x^3}{3!} \dots$$

3. Prove the following:

1) $e^x = \left(\frac{\Delta^2}{E} \right) e^x \frac{E e^x}{\Delta^2 e^x}$.

2) $\Delta \log f(x) = \log \left(1 + \frac{\Delta f(x)}{f(x)} \right)$

Q.3 Answer any two of the following:**14**

1. Express the given polynomials into factorial notation, $f(x) = 3x^3 - 4x^2 + 3x - 11$ and hence find the fourth forward difference.

2. Given n be the positive integer then show that $x^{(-n)} = \frac{1}{(x+n)^{(n)}$ the interval of difference being unity

3. Find the function $f(x)$ whose first forward difference is $x^3 - 3x^2 + 5x - 12$ and also find forward differences of the all order of function $f(x)$

Q.4 Answer any two of the following:**14**

1. Find the order and degree of difference equation $\Delta^2 y_x = 1$ and solve the equation $2y_{k+2} - 13y_{k+1} - 7y_k = 0$ when $y_0 = 0$ and $y_1 = 1 \dots$

2. Show that $y_x = C_1 + C_2 2^x - x$ is a solution of $y_{x+2} - 3y_{x+1} + 2y_x = 1$ and find the particular solution if $y_0 = 0$ and $y_1 = 3$.

3. Find the Linearly independent solution of the difference equation $y_{k+3} - 5y_{k+2} + 2y_{k+1} + 8y_k = 0$ and write general solution..
