

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: IMSc  
BRANCH: MATHEMATICS**

**SEMESTER : VI  
SESSION : SP/2025**

**SUBJECT: MA308 DIFFERENCE EQUATION**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

		CO	BL
Q.1(a) Derive $\Delta^{10}[3^k(k^2 + 2k + 3)]$ .	[5]	1	3
Q.1(b) Calculate $\Delta^{-1}(k^4 - 4k^3 + 2k^2 - k + 10)$ by using factorial polynomials.	[5]	1	4
Q.2(a) Solve: $(k - 1)(k + \frac{1}{2})y_{k+1} - ky_k = 0$ .	[5]	2	3
Q.2(b) Solve: $(k + 2)y_{k+1} - (k + 1)y_k = 5 + 2k - k^2$ .	[5]	2	3
Q.3(a) Use the method of variation of constants to find a particular solution of the equation $y_{k+2} - 3y_{k+1} + 2y_k = 4^k + 3k$ . Hence find the general solution.	[5]	3	4
Q.3(b) Find the general solution of the equation $y_{k+2} - \left(\frac{2k+1}{k}\right)y_{k+1} + \left(\frac{k}{k+1}\right)y_k = k(k+1)$ , given that $y_k^{(1)} = k - 1$ is a solution of the corresponding homogeneous equation.	[5]	3	4
Q.4(a) Solve: $y_{k+2} - 5y_{k+1} + 6y_k = 4^k(1 + k + k^2)$ .	[5]	4	3
Q.4(b) Solve: $y_{k+2} - 3y_{k+1} + 2y_k = 3^k$ , with $y_0 = 1, y_1 = 2$ ; by using z-transformation method.	[5]	4	4
Q.5(a) Solve: $z(k+1, l) - 2z(k, l) + z(k, l-1) = 0$ .	[5]	5	3
Q.5(b) Find the general solution of $z(k+1, l+1) + 2z(k, l) = 3^k(k^2 + l + 1)$ .	[5]	5	4

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