Reg.No : | | | | | | | | | | | |

D.K.M. COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1

SEMESTER EXAMINATIONS

APRIL – 2019 **15CPMA4D**

DIFFERENCE EQUATIONS

Time : 3 Hours **Max. Marks: 75**

SECTION – A (5 x 6 = 30)

Answer ALL the questions.

1. (a) Show that the functions 3^n, $n3^n$, $n^2 3^n$ are linearly independent on $n \geq 1$.

(Or)

(b) Solve the difference equation $(E - 3)(E + 2)y(n) = 5(3^n)$.

2. (a) Find A^n if $A = \begin{pmatrix} 0 & 1 & 1 \\ -2 & 3 & 1 \\ -3 & 1 & 4 \end{pmatrix}$.

(Or)

(b) A $k \times k$ matrix is diagonalizable iff it has k linearly independent Eigen vectors.

3. (a) Find the 2 - tranforms of the sequence $\{na^n\}$ and $\{n^2 a^n\}$.

(Or)

(b) Solve: $x(n+4) + 9x(n+3) + 30x(n+2) + 44x(n+1) + 24x(n) = 0$,

$x(0) = 0,\ x(1) = 0,\ x(2) = 1,\ x(3) = -10$.

4. (a) Show that $t^2 logt + t^3 = 0(t^3)$ as $n \longrightarrow \infty$.

(Or)

(b) Discuss variation of constant formula.

5. (a) Find the limit superior and the limit inferior for the following sequence.

(1) $s_1: 0, 1, 0, 1, \ldots..$
(2) $s_2: 1, -2, 3, -4, \ldots.$
(3) $s_3: 3/2, -1/2, 4/3, -1/3, 5/4 \ldots.$

(Or)

(b) If there exists a Sub sequence $b(n_k) \leq 0$ with $n_{k \to \infty}$ as $k \to \infty$ then every solution of

$P(n)x(n+1) + P(n-1)x(n-1) = b(n),\ x(n)$ Oscillates.

SECTION – B (3 x 15 = 45)

Answer any THREE of the following questions.

6. *State and prove Limiting behaviour of solution.*

7. *Find the general solution of* $x(n+1) = Ax(n)$ *with*

$$A = \begin{pmatrix} 4 & 1 & 2 \\ 0 & 2 & -4 \\ 0 & 1 & 6 \end{pmatrix}.$$

8. *Find the zeros of* $g(z) = z - A - B(z)$ *all lie in the region* $|z| < c$, *for some real positive constant* c, *moreover* $g(z)$ *has finitely many zeros* z *with* $|z| \geq 1$.

9. *State and prove Poincare's theorem.*

10. *If* $c(n) \geq a(n) \geq 0$ *for all* $n > 0$ *and* $z(n) > 0$ *is a solution of*

$$c(n)\, z(n) + \frac{1}{z(n-1)} = 1 \text{ then the equation}$$

$$a(n)y(n) + \frac{1}{y(n-1)} = 1 \text{ has a solution } y(n) \geq z(n) \geq 1 \text{ for all } n \in z^{+}.$$

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