

University Deptt. of Mathematics

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M.Sc: 3rd Semester

Papercode: ECMATH302B

Paper: Difference Equation

SET: A

Answer form all the section as directed.
B. No. 1 is compulsory.

The figures in the right-hand margin
indicate marks.

Candidates are required to give their answers
in their own words as far as practicable.

SECTION - I (Compulsory)

1. Choose the correct option of the following
: 1x10

(a) The no. of equilibrium points of
 $x(n+1) = x^2(n) - x(n) + 1$
is equal to _____.

i) 0 ii) 1 iii) 2 iv) 3

(b) General solⁿ of $2y_{h+2} - 5y_{h+1} + 2y_h = 0$ is
_____.

i) $y_h = c_1 \left(\frac{1}{2}\right)^h + c_2 2^h$

ii) $y_h = c_1 \left(-\frac{1}{2}\right)^h + c_2 \cdot 2^h$

iii) $y_h = c_1 \left(\frac{1}{4}\right)^h + c_2 \cdot 2^h$

iv) $y_h = c_1 \left(-\frac{1}{4}\right)^h + c_2 (-2)^h$

(c) A point b is said to be periodic
point of $f(x)$ if for some integer

k , we have

- i) $f^k(b) = b$ ii) $f^{m+k}(b) = f^m(b)$
 iii) $f(b) = b$ iv) None

- <d> If $y(x) = 2^x$ and $k = 1$ then $\Delta y(0) = -$
 i) $1/2$ ii) 2 iii) 1 iv) 0

<e> A point x^* in the domain of f is said to be an equilibrium point of eqn $x(n+1) = f(x(n))$ if

- i) $f(x^*) = x^*$ ii) $f(x^*) = 2x^*$
 iii) $f(x^*) = x^* - 1$ iv) $3x^*$

<f> If the difference of interval is k then $\Delta^{-1}(k)$ equals _____

- i) $1/x$ ii) 0 iii) x iv) 1

<g> The order of the difference equation $y_{x+2} - 7y_x = 5$ is _____

- i) 2 ii) 1 iii) 3 iv) 4

<h> $\Delta \log f(x) =$ _____
 i) $\log \left[1 + \frac{\Delta f(x)}{f(x)} \right]$ ii) $\log \left[\frac{\Delta f(x)}{f(x)} \right]$

- iii) $\log \left[1 - \frac{\Delta f(x)}{f(x)} \right]$ iv) None

<i> $\Delta^n x^{(n)} =$ _____, where h is an interval of differencing.
 i) h^n ii) $h^n (n-1)$ iii) h^{n+1} iv) None

Q1) The solution of
 $(x+1)y_{x+1} + xy_x = 2x-3$ is _____

i) $y_x = 1 - \frac{2}{x}$ ii) $y_x = 1 + \frac{2}{x}$

iii) $y_x = 1 - \frac{x}{2}$ iv) $1 + \frac{x}{2}$

SECTION - II

Answer any four questions : 4x15

Q2) (a) Define operators Δ , ∇ and E .
 Also prove that $E = I + \Delta$

(b) Prove that
 $y_x = y_{x-1} + \Delta y_{x-1} + \Delta^2 y_{x-2} + \dots + \Delta^n y_{x-n} + \Delta^n y_{x-n}$

Q3) (a) Discuss the cobweb phenomenon with diagrams.

(b) Define the periodic point, eventually periodic point and periodic orbit.

Q4) Solve $y_{x+1} = Ay_x + B$, where A and B are constants. Using this write the solution of $y_{x+1} = 2y_x + 3$; $x = 1, 2, 3 \dots$ with $y_0 = 0$

Q5) (a) Solve $y_{k+3} + 16y_{k-1} = 0$

(b) Define antidifference operator.

Q6) (a) Define fundamental set of solutions for r th order homogeneous difference equation.

(b) Solve $y_{x+2} - 4y_x = 9x^2$

(7) Apply matrix method to solve
 $x_{t+1} - 3x_t + 2x_{t-1} = 0, t = 1, 2, 3, \dots$

(8) Solve $y_{k+2} - 6y_{k+1} + 8y_k = 3k^2 + 2 - 5 \cdot 3^k$
by the method of undetermined coefficients.

or

Eliminate the arbitrary constants
A and B from $y_n = A \cdot 2^n + B \cdot 3^n$
and derive the corresponding difference equation.

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Answer key

SET: A

Q. No.

corresponding ans.

1. Q1 —————> ii

Q2 —————> i

Q3 —————> i

Q4 —————> ii

Q5 —————> i

Q6 —————> ii

Q7 —————> i

Q8 —————> i

Q9 —————> i

Q10 —————> i