Q.5 Deposit made in current month
$= x[n]$

Balance in previous month $= y[n-1]$

Balance in month before that month $= y[n-2]$

Balance in current month $= y[n]$

∴ System can be mathematically described as

$$y[n] = x[n] + (1 + 0.01P_1)y[n-1] + 0.01P_2\, y[n-2]$$

~~P_1 & P_2 are constts~~

Checking Shift Invariance,

$$y_1[n] = y[n-D]$$
$$x_1[n] = x[n-D]$$

(1) $n \to n-D$,

$$\therefore y[n-D] = x[n-D] + (1 + 0.01P_1)y[n-D-1] + 0.01P_2\, y[n-D-2]$$

$$\therefore y_1[n] = x_1[n] + (1 + 0.01P_1)y_1[n-1] + 0.01P_2\, y_1[n-2]$$

∴ Input-output relation doesn't change on shifting input & output in time

∴ the given non-linear system is time shift-invariant.

Condition for shift invariance,

P_1 & P_2 are not the function of 'n' as if they would, the input-output relation will not remain ~~in~~ same.

or

If P_1 & P_2 are function of 'n' (say $P_1 = n$ or $P_2 = n$), the system is not shift-invariant.