Discrete Assignment
EE1205 Signals and Systems

Kamale Goutham
EE23BTECH11028

Question 11.9.5.6: Find the sum of all two digit numbers which when divided by 4,yields 1 as reminder?

Solution:

1) Identify the range of two-digit numbers: The two-digit numbers that satisfy the condition are 13, 17, 21, ..., 97.
2) Find the number of terms in the sequence using the formula:

$$\mathrm{x(n)} = x(0) + n \times \mathrm{d} \tag{1}$$

$$\mathrm{n} = \frac{\mathrm{x(n)} - \mathrm{x(0)}}{\mathrm{d}} \tag{2}$$

$$n = \frac{97 - 13}{4} = 21 \tag{3}$$

3) Use the sum formula to find the sum:

$$S = \frac{n+1}{2} \times (2a + (n)d) \tag{4}$$

where S is the sum, n is the number of terms, a is the first term, and d is the common difference.

Let's calculate it:

Input parameters are:

S.NO	ITEM	VALUE
1	a	13
2	d	4
3	n	22

$$S = \frac{21+1}{2} \times (2 \times 13 + (21) \times 4) \tag{5}$$

$$S = 11 \times (26 + 84) = 1210 \tag{6}$$

Therefore, the sum of all two-digit numbers that, when divided by 4, yield a remainder of 1 is 1210.

$$x(z) = \sum_{k=0}^{\infty} x(k) \times (z^{-k}) \tag{7}$$

By using equation (1):

$$x(z) = \sum_{k=0}^{\infty} (x(0) + kd) \times (z^{-k}) \tag{8}$$

$$x(z) = x(0)(\sum_{k=0}^{\infty} z^{-k}) + d(\sum_{k=0}^{\infty} k \times z^{-k}) \tag{9}$$

$$x(z) = x(0)(1 + z^{-1} + z^{-2} + ...\infty) \tag{10}$$

$$+d(0 + z^{-1} + 2z^{-2} + 3z^{-3} + ...\infty) \tag{11}$$

R.O.C$\rightarrow$ mod $z \geq 1$:

A.G.P formula$\rightarrow \frac{a}{1-r} + \frac{d \times r}{(1-r)^{-2}}$:

G,P formula$\rightarrow \frac{a}{1-r}$:

$$x(z) = x(0)\frac{1}{1-(z)^{-1}} + \tag{12}$$

$$d(z^{-1})(\frac{1}{1-(z)^{-1}} + \frac{1 \times (z)^{-1}}{(1-(z)^{-1})^{-2}}) \tag{13}$$

$$x(z) = 13(z)(z-1)^{-1} + 4(z)^{-1}(\frac{z}{z-1} + \frac{z}{(z-1)^2}) \tag{14}$$

$$x(z) = 13 \times (z)(z-1)^{-1} + 4 \times (z)(z-1)^{-2} \tag{15}$$