Group-33

Review to Group 32 soln. of Tutorial 7 Q. 2, 8, 11, 16

Q.4 → All solutions are correct and correctly done, but they could have used ~~using~~ input shift property of z transformer directly

$$x[n-n_0] \xrightarrow{Z} z^{-n_0}X(z)$$

Q.16 → Question ~~Solution~~ is correctly proven.

Q.8 → Solution of (a) and (b) are correct
(c) → haven't mentioned the ROC i.e, $|z| > \alpha$
(d) they haven't done ~~per~~ this part

Soln:- Part (d)

$$x[n] = \sum_{k=0}^{k=\infty} a^k b^{n-k} \qquad a<b$$

$$= b^n \sum_{k=0}^{k=\infty} \left(\frac{a}{b}\right)^k \qquad \text{as } \frac{a}{b}<1$$

$$= \frac{b^n}{1-a/b}$$

$$X(z) = \sum_{n=-\infty}^{+\infty} x[n] z^{-n} = \sum_{n=-\infty}^{+\infty} \frac{(bz^{-1})^n}{1-a/b}$$

X(z) for this dosen't exist as above series never converges for any $|z|$

Q.11 → Part (a) and (b) are correctly done
In part (c) they have directly assumed $y[n] = K\left(\frac{1}{2}\right)^n u[n]$ and showed that solution won't exist that is wrong

they can solve it using z-transform as

$x[n] = (1/2)^n u[n] \rightarrow X(z) = \frac{1}{1-\frac{1}{2}z^{-1}}$, $|z|>1/2$

$y[n] \rightarrow Y(z)$

$$Y(z) = \frac{3}{4}z^{-1}Y(z) - \frac{1}{8}z^{-2}Y(z) + 2X(z)$$

$$\therefore Y(z)\left[1-\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}\right] = \frac{2}{1-\frac{1}{2}z^{-1}} \qquad |z|>1/2$$

$$\therefore Y(z) = \frac{2}{(1-\frac{1}{2}z^{-1})^2(1-\frac{1}{4}z^{-1})} \qquad |z|>1/2$$

$$\therefore Y(z) = \frac{A}{1-\frac{1}{4}z^{-1}} + \frac{B+Cz^{-1}}{(1-\frac{1}{2}z^{-1})^2} \qquad |z|>1/2$$

A B C ~~can~~ be found out by $A(1-\frac{1}{2}z^{-1})^2 + (1-\frac{1}{4}z^{-1})(B+Cz^{-1}) = 2$

Now as $x[n] \xrightarrow{Z} X(z) = \frac{1}{1-\frac{1}{2}z^{-1}}$

$n x[n] \xrightarrow{Z} -z\frac{dX(z)}{dz} = \frac{\frac{1}{2}z^{-1}}{(1-\frac{1}{2}z^{-1})^2}$

also $(n+1)x[n+1] \xrightarrow{Z} \frac{1/2}{(1-\frac{1}{2}z^{-1})^2}$

$\therefore \quad y_p[n] = A\left(\frac{1}{4}\right)^n u[n] + 2B(n+1)\cancel{(\ )}x[n+1] + 2C\, n x[n]$

hence we won't get directly resemblence of $x[n]$, we get modified version of input

and hence from this we can get general solⁿ

$$y[n] = \underbrace{C_1 y_1[n] + C_2 y_2[n]}_{\text{homogeneous sol}^n} + y_p[n]$$