1.- Programar la forma estándar, directa, serie y paralelo de la siguiente función de transferencia

$$G(z)=\frac{uz^{-3}+(2-u)z^{-2}+(u-3)z^{-1}+(1-\frac{u}{4})}{5uz^{-3}+(6-u)z^{-2}+(7-u)z^{-1}+(1-\frac{u}{8})}$$

u: último número del numero de cuenta del alumno

EQUIPO 2
u=2

Solución:

$$G(z)=\frac{(2)z^{-3}+(2-2)z^{-2}+(2-3)z^{-1}+(1-\frac{2}{4})}{5(2)z^{-3}+(6-2)z^{-2}+(7-2)z^{-1}+(1-\frac{2}{8})}$$

$$G(z)=\frac{2z^{-3}-1z^{-1}+(\frac{4}{4}-\frac{2}{4})}{10z^{-3}+(4)z^{-2}+5z^{-1}+(\frac{8}{8}-\frac{2}{8})}$$

$$G(z)=\frac{2z^{-3}-z^{-1}+(\frac{2}{4})}{10z^{-3}+4z^{-2}+5z^{-1}+(\frac{6}{8})}$$

$$\boxed{G(z)=\frac{2z^{-3}-z^{-1}+\frac{1}{2}}{10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}}}\ \text{(simplificada)}$$

PROGRAMACIÒN FORMA DIRECTA

$$G(z)=\frac{Y(z)}{X(z)}=\frac{2z^{-3}-z^{-1}+\frac{1}{2}}{10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}}$$

$$G(z)=\frac{Y(z)}{X(z)}=\frac{2z^{-3}-z^{-1}+\frac{1}{2}}{10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}}$$

$$\frac{Y(z)\left(10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}\right)}{1}=\frac{X(z)\left(2z^{-3}-z^{-1}+\frac{1}{2}\right)}{1}$$

$$Y(z)\left(10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}\right)=X(z)\left(2z^{-3}-z^{-1}+\frac{1}{2}\right)$$

$$10Y(z)z^{-3}+4Y(z)z^{-2}+5Y(z)z^{-1}+\frac{3}{4}Y(z)=$$

$$2X(z)z^{-3}-X(z)z^{-1}+\frac{1}{2}X(z)$$

$$+\frac{3}{4}Y(z)=$$

$$2X(z)z^{-3}-X(z)z^{-1}+\frac{1}{2}X(z)-\left(10Y(z)z^{-3}+4Y(z)z^{-2}+\right.$$

$$+Y(z)=$$

$$\frac{4}{3}\left[2X(z)z^{-3}-X(z)z^{-1}+\frac{1}{2}X(z)-\left(10Y(z)z^{-3}+4Y(z)z^{-2}\right.\right.$$

$$+Y(z)=$$

$$\frac{4}{3}\left[2X(z)z^{-3}-X(z)z^{-1}+\frac{1}{2}X(z)-10Y(z)z^{-3}-4Y(z)z^{-2}\right.$$

$$Y(z)=$$

$$\frac{8}{3}X(z)z^{-3}-\frac{4}{3}X(z)z^{-1}+\frac{4}{6}X(z)-\frac{40}{3}Y(z)z^{-3}-\frac{16}{3}Y(z)z$$

$$\boxed{Y(z)=\frac{8}{3}X(z)z^{-3}-\frac{4}{3}X(z)z^{-1}+\frac{2}{3}X(z)-\frac{40}{3}Y(z)z^{-3}-\frac{16}{3}Y(z)z}$$

DIAGRAMA DE BLOQUES
PROGRAMACION DIRECTA

PROGRAMAR FORMA ESTANDAR

$$\boxed{G(z)=\frac{2z^{-3}-z^{-1}+\frac{1}{2}}{10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}}}\ \text{(simplificada)}$$

$$G(z)=\frac{Y(z)}{X(z)}=\frac{2z^{-3}-z^{-1}+\frac{1}{2}}{10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}}$$

$$\frac{Y(z)}{X(z)}=\frac{Y(z)}{V(z)}\frac{V(z)}{X(z)}=\frac{2z^{-3}-z^{-1}+\frac{1}{2}}{10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}}$$

$$\frac{Y(z)}{V(z)}\frac{V(z)}{X(z)}=\left(\frac{2z^{-3}-z^{-1}+\frac{1}{2}}{1}\right)\left(\frac{1}{10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}}\right)$$

Donde:

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

$$\frac{V(z)}{X(Z)}=\frac{1}{10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}}$$

De aquí, hacemos un cambio de variable para Y(z) y X(z), (despeje)

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

$$Y(z)=V(z)\left(2z^{-3}-z^{-1}+\frac{1}{2}\right)$$

$$\boxed{Y(z)=2V(z)z^{-3}-V(z)z^{-1}+\frac{1}{2}V(z)}$$

$$\frac{V(z)}{X(Z)}=\frac{1}{10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}}$$

$$V(z)\left(10z^{-3}+4z^{-2}+5z^{-1}+\frac{3}{4}\right)=X(Z)$$

$$\left(10V(z)z^{-3}+4V(z)z^{-2}+5V(z)z^{-1}+\frac{3}{4}V(z)\right)=X(Z)$$

$$\left(\frac{3}{4}V(z)\right)=X(Z)-\left(10V(z)z^{-3}+4V(z)z^{-2}+5V(z)z^{-1}\right)$$

$$V(z)=\frac{4}{3}\left\{X(Z)-\left[10V(z)z^{-3}+4V(z)z^{-2}+5V(z)z^{-1}\right]\right\}$$

$$V(z)=\left\{\frac{4}{3}X(Z)-\frac{40}{3}V(z)z^{-3}-\frac{16}{3}V(z)z^{-2}-\frac{20}{3}V(z)z^{-1}\right\}$$

$$\boxed{V(z)=\frac{4}{3}X(Z)-\frac{40}{3}V(z)z^{-3}-\frac{16}{3}V(z)z^{-2}-\frac{20}{3}V(z)z^{-1}}$$

DIAGRAMA DE BLOQUES
PROGRAMACION STANDAR

PROGRAMACIÒN FORMA SERIE O CASCADA

$$\boxed{H(z)=\prod_{k=1}^{K}H_k(Z)}$$

$$K=\frac{N+1}{2}$$

$$H_k(Z) = \frac{b_{k0} + b_{k1}z^{-1} + b_{k2}z^{-2} + b_{k3}z^{-3}}{1 + a_{k0} + a_{k1}z^{-1} + a_{k2}z^{-2} + a_{k3}z^{-3}}$$

Tenemos G(Z):

$$\boxed{G(z) = \frac{2z^{-3} - z^{-1} + \frac{1}{2}}{10z^{-3} + 4z^{-2} + 5z^{-1} + \frac{3}{4}}} \text{ (simplificada)}$$

MEJOR:

$$G(z) = \frac{2 - z^2 + \frac{1}{2}z^3}{10 + 4z^1 + 5z^2 + \frac{3}{4}z^3}$$

Obteniendo los polos y ceros:

$$G(z) = \frac{(z - [1.5652 + j1.0434])(z - [1.5652 - j1.0434])(z}{(z - [-0.2573 + j1.4495])(z - [-0.2573 - j1.4495])}$$

Dividiendo entre Z, numerador y denominador

$$G(z) = \frac{(1 - [1.5652 + j1.0434]z^{-1})(1 - [1.5652 - j1.0434}{(1 - [-0.2573 + j1.4495]z^{-1})(1 - [-0.2573 - j1.44}$$

Y un posible empaquetamiento de los polos y ceros sería:

$$G(z) = \frac{(1 - [1.5652 + j1.0434]z^{-1})(1 - [1.5652 - j1.0434}{(1 - [-0.2573 + j1.4495]z^{-1})(1 - [-0.2573 - j1.44}$$

$$(1 - 1.5652z^{-1} - j1.0434z^{-1})$$
$$(1 - 1.5652z^{-1} + j1.0434z^{-1})$$

$$1 - 1.5652z^{-1} - j1.0434z^{-1} - 1.5652z^{-1}$$
$$+ (1.5652)^2 z^{-2} + (1.5652z^{-1})(j1.0434z^{-1})$$
$$+ j1.0434z^{-1} - (1.0434z^{-1})(j1.5652z^{-1})$$
$$- (j1.0434z^{-1})^2$$

$$1 - 2(1.5652)z^{-1} + (1.5652)^2 z^{-2}$$
$$- (j1.4644z^{-1})^2$$

numerador:

$$1 - 3.1304z^{-1} + 4.5943z^{-2}$$

para el denominador

$$(1 - [-0.2573 + j1.4495]z^{-1})$$
$$(1 - [-0.2573 - j1.4495]z^{-1})$$

$$(1 + 0.2573z^{-1} - j1.4495z^{-1})$$
$$(1 + 0.2573z^{-1} + j1.4495z^{-1})$$

$$1 + 0.2573z^{-1} - j1.4495z^{-1} + 0.2573z^{-1}$$
$$(0.2573)^2 z^{-2} - (0.2573z^{-1})(j1.4495z^{-1})$$
$$+ j1.4495z^{-1} `+(0.2573z^{-1})(j1.4495z^{-1})$$
$$- (j1.4495z^{-1})^2$$

$$1 - 2(0.2573)z^{-1} + (0.2573)^2 z^{-2}$$
$$- (j1.4495z^{-1})^2$$

$$1 - 0.5146z^{-1} + 0.0662z^{-2} + 2.1010z^{-2}$$

denominador

$$1 - 0.5146z^{-1} + 2.1672z^{-2}$$

$$G(z) = \frac{(1 - 3.1304z^{-1} + 4.5943z^{-2})(1 + 1.1304z^{-1})}{(1 - 0.5146z^{-1} + 2.1672z^{-2})(1 + 6.1520z^{-1})}$$

por lo tanto una posible ordenación quedaria:

$$G_1(z) = \frac{(1 - 3.1304z^{-1} + 4.5943z^{-2})}{(1 - 0.5146z^{-1} + 2.1672z^{-2})}$$

$$G_2(z) = \frac{(1 + 1.1304z^{-1})}{(1 + 6.1520z^{-1})}$$

$$G(z) = G_1(z)G_2(z)$$

DIAGRAMA DE BLOQUES
PROGRAMACION STANDAR

PROGRAMACIÒN FORMA PARALELO

$$G(z) = G_1(z) + G_2(z) + G_3(z) + \bullet\bullet\bullet$$

$$\boxed{G(z) = \frac{2z^{-3} - z^{-1} + \frac{1}{2}}{10z^{-3} + 4z^{-2} + 5z^{-1} + \frac{3}{4}}} \text{ (simplificada)}$$

$$G(z) = \frac{(1 - 3.1304z^{-1} + 4.5943z^{-2})(1 + 1.1304z^{-1})}{(1 - 0.5146z^{-1} + 2.1672z^{-2})(1 + 6.1520z^{-1})}$$

$$\frac{(z^2 - 3.1304z + 4.5943)(z + 1.1304)}{(z + 6.1520)(z^2 - 0.5146z + 2.1672)} = \frac{A}{(z + 6.1520)} + \frac{Bz + C}{(z^2 - 0.5146z + 2.1672)}$$

Multiplicando por el minimo comùn multiplo:

$$(z^2 - 3.1304z + 4.5943)(z + 1.1304) = A(z^2 - 0.5146z + 2.1672) + (Bz + C)(z + 6.1520)$$

Haciendo el producto del extremo izquierdo:

$$(z^3 - 2z^2 + 1.0557z + 5.1943) = A(z^2 - 0.5143z + 2.1672) + (Bz + C)(z + 6.1520)$$

$$(z^3 - 2z^2 + 1.0557z + 5.1943) = Az^2 - 0.5143Az + 2.1672A + Bz^2 + 6.1520Bz + Cz + 6.1520C$$

$$(z^3 - 2z^2 + 1.0557z + 5.1943) = (A + B)z^2 + (6.1520B - 0.5143A + C)z + (2.1672A + 6.1520C)$$

igualando terminos:

HASTA AQUÍ VOY NO HAGAS CASO LO QUE SIGUE

$$1 = 0 \_\_\_\_\_ ERROR$$
$$(A + B) = -6$$
$$(6.6851B + C - 2.685A) = 8$$
$$(17.9498A + 6.6851C) = -12$$

A=-4.1398
B=-1.8602
C=9.3204

$$G(z) = \frac{-4.1398}{(z + 6.6851)} + \frac{-1.8602z + 9.3204}{(z^2 - 2.685z + 17.9498)}$$