letter on the answer sheet provided.

* For the system shown in Fig.1, answer the following two questions. (assume that $G_3(s)=\dfrac{G_2(s)}{s}$, and

$G_4(s)=\dfrac{G_1(s)G_2(s)H(s)}{s}$.

Q1. The characteristic equation is

(a) $z+(z-1)D(z)G_4(z)=0$ (b) $z+(z-1)D(z)G_3(z)=0$ (c) $1+(z-1)D(z)G_4(z)=0$

(d) $1+(z-1)D(z)G_3(z)=0$ (e) none

Q2. If the output $Y(z)=\dfrac{F(z)}{\Delta(z)}$, then $F(z)$ is

(a) $D(z)G_3(z)RG_1(z)$ (b) $D(z)G_3(z)R(z)G_1(z)$ (c) $(z-1)D(z)G_3(z)RG_1(z)$

(d) $(1-z^{-1})D(z)G_3(z)RG_1(z)$ (e) $(1-z^{-1})D(z)G_3(z)R(z)G_1(z)$

Q3. The mapping of the points the in the $s-plane$, $s=\pm j\dfrac{\pi}{T}+\sigma$, into the $z-plane$ (where T is the sampling time and $\sigma\le 0$) is

(a) $z=r,\ 0\le r\le 1$ (b) $z=-r,\ 0\le r\le 1$ (c) $z=-r,\ -1\le r\le 0$

(d) $z=-r,\ r\ge 0$ (e) $z=-r,\ r\le 0$

*Consider a discrete time system whose transfer function is $\dfrac{Y(z)}{R(z)}=0.5T\dfrac{z+1}{z-1}$, if $r(k)=(0.5)^k u(k)$, and $T=1$sec., answer the following three questions.

Q4. The response $y(k)$ is

(a) $1.5(4-3(0.5)^k)u(k)$ (b) $(4-3(0.5)^k)u(k)$ (c) $1.5(4-3(0.5)^k)u(k)$ (d) $2(4-3(0.5)^k)u(k)$

(e) none

$6-$ $4-3(0.5)^k$ $6-4.5(0.5)^k$ $[8-6(0.5)^k]u(k)$

Q5. The steady state response $y(\infty)$ is

(a) 1 (b) 2 (c) 1.5 (d) 0.25 (e) 0.5

Q6. Suppose we have a continuous time system described by $\dot{x}(t) = Ax(t)$, then the discrete equivalent system at sampling period T, using the Trapazoidal rule is

(a) $x(k+1) = (I - 0.5AT)^{-1}x(k)$ (b) $x(k+1) = (I + 0.5AT)(I - 0.5AT)^{-1}x(k)$

(c) $x(k+1) = (I + 0.5AT)^{-1}x(k)$ (d) $x(k+1) = (I + 0.5AT)^{-1}(I - 0.5AT)x(k)$ (e) none

Q7. Suppose the z – transfer function of a discrete time system is $\dfrac{Y(z)}{R(z)} = \dfrac{z}{2z-1}$, if $r(k) = \delta(k-3)$, then $y(k)$

(a) $4(0.5)^k u(k-3)$ (b) $(0.5)^{k-3}u(k-3)$ (c) $4(0.5)^{k-3}u(k-3)$ (d) $4(0.5)^k u(k)$ (e) none

Q8. If the Laplace transform of a continuous signal is $E(s) = \dfrac{e^{-s}}{s}$, then the z – transform of $E^*(s)$ is (let $T = 0.2$ sec.)

(a) $\dfrac{1}{z^6 - z^5}$ (b) $\dfrac{1}{z^5 - z^4}$ (c) $\dfrac{z}{z^5 - z^4}$ (d) $\dfrac{z}{z^5 - z^4}$ (e) none

Q9. If the input of a zero order hold is $\boxed{\delta(t-T)}$, then its output is (assume that the sampling time is T)

(a) $u(t-T)$ (b) $u(t) - u(t-T)$ (c) $u(t-T) - u(t-2T)$ (d) $u(t) - u(t-2T)$ (e) none

Q10. If $E(z) = \dfrac{4z^2 - 3z}{D(z)}$, and $e(k) = \alpha_1(\sqrt{2})^k \cos(0.75\pi k + \theta)u(k)$, then $D(z)$

(a) $z^2 + z + 2$ (b) $z^2 - 2z + 2$ (c) $z^2 + 2z - 2$ (d) $z^2 + 2z + 2$ (e) $z^2 + z + 1$

**Suppose we have a discrete time system described by the following difference equation $y(k+1) + \alpha_1 y(k) = \alpha_2 r(k)$, where $r(k) = u(k)$, If $Y(z) = \dfrac{4z^2 - z}{(z-1)(z+0.5)}$, then answer the following four questions

Q11. The value of α_1 is

(a) 1 (b) -1 (c) -0.5 (d) 3 $\boxed{\text{(e) 0.5}}$

Q12. The value of α_2 is

(a) 1 (b) -1 (c) -3 (d) 3 (e) 0.5

Q13. The value of $y(0)$ is

(a) 0 (b) 2 $\boxed{\text{(c) 4}}$ (d) 3 (e) 1

$y(0) = \lim$

$y(\infty) = \lim_{z \to 1} (z-1)\, y(z)$

Q14. The value of $y(\infty)$ is

(a) 1 (b) 0 $\boxed{\text{(c) 2}}$ (d) $-\infty$ (e) ∞

Q15. If $E(z) = \dfrac{1}{(z+0.1)^2}$, then $e(k) = Z^{-1}(E(z))$ is

(a) $100(k-1)(-0.1)^k u(k-1)$ (b) $(k-1)(-0.1)^k u(k-2)$ (c) $-100(k-1)(-0.1)^k u(k-1)$

(d) $100(k-1)(-0.1)^k u(k)$ (e) $-100(k-1)(-0.1)^k u(k)$

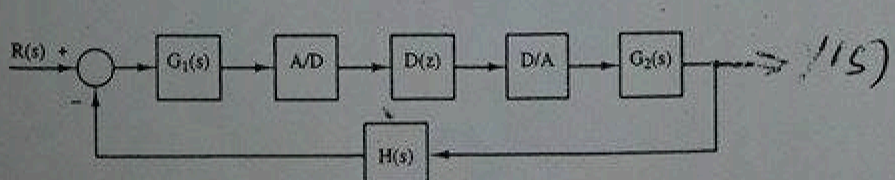

Fig.1