ELECTRICAL ENGINEERING DEPARTMENT

EEPC35 Control System-II **B.Tech Vth Semester**

Tutorial Sheet 1

1. Find the z-transforms of

   $a) X(s) = \frac{1}{s(s+1)}$

   b) $x(t) = e^{-at}$

   c) $x(t) = A\cos(\omega t + \varphi)$

   d) $x(t) = e^{-at}\cos\omega t$

2. Find the z-transforms using theorem

$$x(t) = e^{-at}\sin\omega t$$

3. Find the Z-transform of the following function.

   A- **F(s)** = $\frac{4}{S^2(S+2)}$, **F(s)**= $\frac{2}{S^2+S+2)}$, **F(s)** = $\frac{2(S+1)}{S(S+2)}$, **F(s)** = $\frac{10}{S(S^2+S+2)}$

   B- **F(k)**=$0.1^K Us(K) + 0.5k(0.1^k)Us(k)$

4. Solve the following difference equation using z-transform

   a) y(k+2) +3y(k+1) +2y(k)=); y(-1)= -0.5 ,y(-2)= 0.75

   b) 2y(k)-2y(k-1) +y(k-2) = r(k) y(k)=0 for k<0 and

$$r(k) = \begin{cases} 1\,; k = 0,1,2 \ldots \ldots \\ 0; \quad k < 0 \end{cases}$$

   c) y(k)- 3y(k-1)+2y(k-2) = r(k) where

$$r(k) = \begin{cases} 1\ for\ k = 0,1 \\ 0\ for\ k \geq 2 \end{cases};\ y(-2) = y(-1) = 0$$

   Will the final value theorem give the correct value of y(k) as k→∞? Why?

5. For the transfer function models and inputs given below, find the response as a function of k

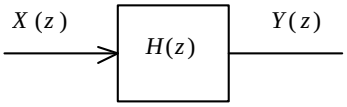
   a) $G(z) = \frac{Y(z)}{R(z)} = \frac{2z-3}{(z-0.5)(z+0.3)}$ $r(k) = \begin{cases} 1, & k\ even \\ 0, & k\ odd \end{cases}$

   b) $G(z) = \frac{Y(z)}{R(z)} = \frac{-6z+1}{(z-0.5+j0.25)(z-0.5-j0.25)}$ $r(k) = \begin{cases} 0, & k < 0 \\ 1, & k = 0,1,2,3,.. \end{cases}$

   c) $G(z) = \frac{Y(z)}{R(z)} = \frac{1}{(z-0.5)(z+0.3)}$ $r(k) = \begin{cases} 1, & k\ even \\ 0, & k\ odd \end{cases}$

   d) $(z) = \frac{Y(z)}{R(z)} = \frac{1}{(z-0.5)^2(z-0.1)}$ $r(k) = \begin{cases} 0, & k < 0 \\ 1, & k = 0,1,2,3,.. \end{cases}$

6. Write down an expression in the z-domain for $Y(z)$ in terms of $X(z)$ and $H(z)$.



7. Write down an expression for $X(z)$ in terms of $x(n)$.
8. Write down an expression for $y(n)$ in terms of $x(n)$ and $h(n)$.
9. Show that your expression for $y(n)$ in question 3 is related to your expression for $Y(z)$ in question 1 by the z-transform.
10. Find the inverse z-transform of the system using partial fraction method and power series method
    a) $X(z) = \frac{7z^2+5z}{z^2+2z+3}$
    b) $X(z) = \frac{(1-e^{-aT})z}{(z-1)(z-e^{-aT})}$