CONTROL THEORY-II
RIC 701
COMPREHENSIVE ASSIGNMENT-1, 2

1. Describe sample and hold operation with circuit diagram.
2. Discuss the system with sampler and zero order hold.
3. What is zero order hold? Write its transfer function.
4. Derive the expression to convert continuous time signal (s-plane) to discrete time signal (z-plane) using bilinear transformation.
5. Assume $y(0)=0$, $y(1)=1$, u(k) is the unit step function, Solve the following differential equation for $k \geq 0$.

$$y(k+2) - \frac{3}{4}y(k+1) + \frac{1}{8}y(k) = u(k)$$

   Show all steps involved to determine partial fraction coefficient.

6. Determine z transform of $r(t) = e^{-at}\, u_s(t)$. Let input *r(t)* is given to S/H circuit. Prove that if T→ 0 output of sample and hold circuit is same as input.

7. Consider the characteristics polynomial

$$\nabla(z) = 2Z^4 + 7Z^3 + 10Z^2 + 4Z + 1$$

   Using Jury table, **determine** whether system is stable or not (Show all steps).

8. Explain digital PID controller. Also draw the suitable diagram having digital PID controller with plant.
9. Explain Ziegler-Nichols tuning method based on ultimate gain and ultimate time period.
10. Explain constant damping loci and Constant frequency loci.
11. Discuss an error sampled feedback system (derive transfer function).