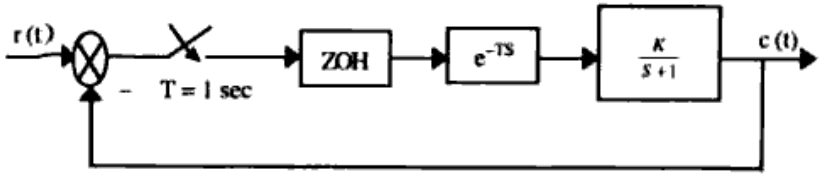
Determine the range of "k" for the system show in below figure to be stable.



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Roll No .....

EI - 802

B.E. VIII Semester

Examination, June 2016

Digital Control Systems

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
ii) All parts of each question are to be attempted at one place.
iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.
iv) Except numericals, Derivation, Design and Drawing etc.

1. a) List the advantages of digital control system.

   b) Define sampling theorem.

   c) What is the resolution of a 3 bit ADC with 5V as a reference?

   d) Explain the sample and hold operation and also derive the digital equivalent for zero order hold.

   OR

   Consider the difference equation system

   $y(k+1)+0.5\,y(k)=x(k)$

   Where $Y(0)=0$. Obtain the response $y(k)$ when the input $x(k)$ is a unit step sequence.

2. a) What is pulse transfer function?

   b) What are the limitations of Z transform?

   c) Derive the relation between s-plane and Z plane.

   d) Obtain the Z transform of $X(s)=\frac{1-e^{-sT}}{s}\frac{1}{(S+a)^2}$.

OR

Solve the following difference equation using z-transforms:

$y(k)-3y(k-1)+2y(k-2)=r(k)$

where $r(k)=1$ for $k=0$, 1 and 0 for $k>2$; $y(-2)=y(-1)=0$.

3. a) What is asymptotic stability?

   b) List the necessary conditions for stability using Jury stability method.

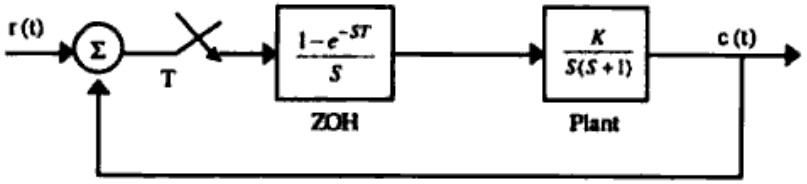
   c) How to find the crossing of unit circle in the root locus?

   d) Examine the stability of the characteristics equation

$P(z)=z^3-1.1z^2-0.1z+0.2$

OR

Find the stability using root locus for the range K when T=1sec, 2sec.



4. a) What is Anti-Aliasing filter?

   b) What is folding?

   c) Explain the forward difference method.

   d) Derive the relation between w-plane and z-plane.

OR

Obtain the Jordan canonical form realizations for the following transfer function $\frac{Y(z)}{R(z)}=\frac{3z^2-4z+6}{\left(z-\frac{1}{3}\right)^3}$.

5. a) What is sampled data control system?

   b) What is state transition matrix of discrete time system?

   c) Consider the system

$$\begin{bmatrix}x_1(k+1)\\x_2(k+1)\end{bmatrix}=\begin{bmatrix}0&1\\-2&-3\end{bmatrix}\begin{bmatrix}x_1(k)\\x_2(k)\end{bmatrix}+\begin{bmatrix}0\\1\end{bmatrix}(-1)^k$$

Find $y(k)$ for $k>1$.

   d) A discrete time system has the transfer function $\frac{Y(z)}{U(X)}=\frac{4z^3-12z^2+13z-7}{(z-1)^2(z-2)}$ Determine the state model of the system in phase variable form.

OR