Control System

EE18BTECH11008
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Question 15

The characteristic equation of linear time invariant system is given by

$$\nabla(s) = s^4 + 3s^3 + 3s^2 + s + k = 0$$

The system is BIBO stable if

A.0<k< $\frac{12}{9}$

B.k>3

C.0<k< $\frac{8}{9}$

D.k>6

solution

Givendata:

$$\nabla(s) = s^4 + 3s^3 + 3s^2 + s + k = 0$$

s^4	1	3	K
s^3	3	1	0
s^2	8/3	k	0
s	(8/3-3K)/(8/3)	0	0
s^0	k	0	0

$$\frac{\frac{8}{3} - 3k}{\frac{8}{3}} > 0$$

$$\frac{8}{3} - 3k > 0$$

$$3k < \frac{8}{9}$$

$$(0 < k < \frac{8}{9})$$

for example the zeros of polynomial $s^4 + 3s^3 + 3s^2 + s + 0.5 = 0 are$

$$s1 = -0.08373 + 0.45773i$$

$$s2 = -0.08373 - 0.45773i$$

$$s3 = -1.41627 + 0.55075i$$

$$s4 = -1.41627 - 0.55075i$$