

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT

EE380 [091] sec # _____	quiz # 7
Name: <u>Key Sol</u>	ID: _____ Grade: _____

Use Routh Hurwitz to find all the roots of the following polynomial.
DO NOT USE CALCULATOR

$$P(s) = s^7 + s^6 + 2s^5 + 2s^4 - s^3 - s^2 - 2s - 2 = 0$$

s^7	1	2	-1	-2	0
s^6	1	2	-1	-2	0
s^5	$\phi 3$	$\phi 4$	$\phi -1$	0	0
s^4	$\frac{2}{3}$	$-\frac{2}{3}$	-2	0	0
s^3	7	8	0	0	0
s^2	$-\frac{10}{7}$	-2	0	0	0
s^1	$-\frac{9}{5}$	0	0	0	0
s^0	-2	0	0	0	0

$$A(s) = s^6 + 2s^4 - s^2 - 2$$

$$\frac{dA}{ds} = 6s^5 + 8s^3 - 2s$$

$$= 3s^5 + 4s^3 - 1s$$

$$A(s) = s^4(s^2 + 2) - (s^2 + 2)$$

$$= (s^2 + 2)(s^4 - 1)$$

$$= (s^2 + 2)(s^2 - 1)(s^2 + 1)$$

$$\therefore P(s) = (s+1)(s^2+2)(s^2-1)(s^2+1)$$

roots are

$$-1, -1, 1, \pm j, \pm j\sqrt{2}$$

One sign change \Rightarrow 1 root in R.H.P

