Mathematics Quiz Fall 1996
ME451: Control Systems

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(8pts) 1. Complete the indicated operation giving the result in both "*a+bi*" and "$Re^{i\theta}$" forms. Watch your units! and enter answer in the appropriate box.

Operation	"*a+bi*"	"$Re^{i\theta}$"
(0+4i)+(2+2i)		
(1+2i)(3+5i)		
$e^{i\pi} - e^{-i\pi}$		
$\frac{e^{i\pi}}{5e^{i(\pi/2)}}$		

(5 pts) 2.Find the determinant of the matrix below. Show work and Enter result in the space.

Determinant of $\begin{bmatrix} 1 & 3 & 0 & 0 \\ 2 & 2 & 2 & 0 \\ 0 & 2 & 0 & 2 \\ 0 & 1 & 0 & 3 \end{bmatrix} =$ _____

enter result above

(5 pts) 3.Find the inverse of the matrix below. Show work and Enter result in the space provided.

Inverse of $\begin{bmatrix} 1 & 0 & 3 \\ 0 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix} =$ $\begin{bmatrix} & & \\ & & \\ & & \\ & & \\ & & \end{bmatrix}$

(5pts) 5. Find x_2 in the set of linear equations below using Kramer's Rule. Show work

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 3 \\ 1 & 2 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

(8pts) 5. Find the solution of the 1st order differential equation below using Laplace Transforms.

$$3\dot{x} + 12x = 2\sin(3t), \quad x(0) = 0$$

Time Function e(t)	Laplace Transform E(s)
step, u(t)	$\frac{1}{s}$
ramp, t	$\frac{1}{s^2}$
exponential, e^{-at}	$\frac{1}{(s+a)}$
te^{-at}	$\frac{1}{(s+a)^2}$

Time Function e(t)	Laplace Transform E(s)
$\sin(bt)$	$\frac{b}{s^2+b^2}$
$\cos(bt)$	$\frac{s}{s^2+b^2}$
$e^{-at}\sin(bt)$	$\frac{b}{(s+a)^2+b^2}$
$e^{-at}\cos(bt)$	$\frac{s+a}{(s+a)^2+b^2}$

Solutions

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EDU»
0+4i + 2+2i = 2+6i = 6.325*exp(1.249i)
1+2i * 3+5i = -7+11i = 13.04*exp(2.138i)
-1 - -1 = 0 = 0*exp(0i)
-1 / -0-5i = 0-0.2i = 0.2*exp(-1.571i)

A =

    1     3     0     0
    2     2     2     0
    0     2     0     2
    0     1     0     3

det(A)=-8

B =

    1     0     3
    0     2     1
    0     1     2

inv(B)

ans =

   1.0000    1.0000   -2.0000
        0    0.6667   -0.3333
        0   -0.3333    0.6667

echo off

A =

    1     1     0
    0     2     3
    1     2     3


f =

    1
    0
    0


x =

         0
    1.0000
   -0.6667
```