University of Jordan
Elect. Eng. Dept.

Control Systems 93441 **First Exam** **Tues. 31/10/1995**

1

a) Imagine that you constructed a schematic block diagram to represent a control system regarding a person who is driving a motor cycle at constant speed and following a prescribed path for five hours.
In your diagram what represent :
the sensor , the comparator , the feedforward element , the disturbance and the parameter variations.

b) Given the block diagram shown in **Fig.1** :

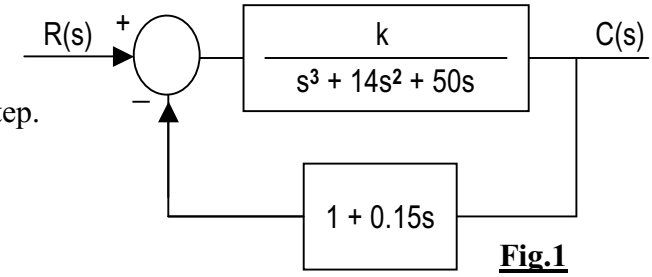

Fig.1

i) Find c(t) when k = 100 and the set value is a unit step.
ii) What positive k will destabilize the system ?

c) Using analog computers ;
simulate $\dot{x} + 8x = 40$; x(0) = 3 such that x and $\dot{x}$ are available for measurements .
sketch $\dot{x}(t)$.

2

a) If possible **; introduce minimum number** of components in order to have :

i) ζ = 0.75 and steady state output = 2 , given $G(s) = \dfrac{1}{s^2 + 3s + 4}$

ii) ζ = 1 and ω_n 4 rad/s , given G(s) as in (2ai) .

iii) e_{ss} = ¼ due to **a unit ramp** , given $g(s) = \dfrac{k}{s^3 + 2s^2 + 3s}$

b) Given $\dot{x} = -2x + 5h$ and $\ddot{h} = 6x - 15h + r(t)$;
represent as a block diagram with X(s) as output ; R(s) as set value ;
using integrators , any gains and two input comparators .

c) Using block diagrams reduction techniques .

Find $\dfrac{C(s)}{R(s)}$ for the diagram shown .