

12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	1707684/1
2	Title of Examination Paper	DYNAMICS CONTROL 3 INSTRUMENTATION
3	Module Code	GOAC4005-006
4	Date and Time of Examination	15 MAY 2019
5	Examination Venue	WARD 2 COLLEGE HILL HOUSE
6	Seat Number	4
7	Number of Answer Books handed in	

[illegible]

✓ 34%

Question one



Gravity 9.81 ↓

L to Plane	Horizontal	Vertical	
S			Displacement
U	$80 \sin 40 = 51.42$	$80 \sin 64 = 71.90$	Initial Velocity
V	$80 \cos 64 = 35.06$		Final Velocity
A	$-9.81 \cos 24$	-9.81	Acceleration
T	11.37 s	11.37 s	Time

$$S = ut + \frac{1}{2} at^2$$

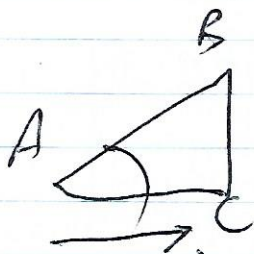
$$1a \quad 0 = 80 \sin(40)t + \frac{1}{2} (-9.81) \cos 24 t^2$$

$$0 = 80 \sin(40) t - 4.95 \cos(24) t^2$$

$$0 = t 80 \sin(40) - 4.95 \cos(24) t$$

$$t = \frac{80 \sin(40)}{4.95 \cos(24)} = \frac{51.42}{4.52} = 11.37 \text{ seconds}$$

1b



110

11.37 ✓

6. ✓

$$\cos 16 = 0.96$$

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$$\cos 16 = 0.96$$

$$80 \cos 40 = 61.28 \times 11.37 = \frac{697.}{0.96}$$

$$= 726 \text{ m}$$

Question 2.

2.

$$A \quad S = \frac{24t^2 + 18t - 17}{48t + 18}$$

$$B \quad S = \frac{14t^2 + 5t + 25}{28t + 5}$$

$$V_A = 3 \times V_B$$

$$48t + 18 = 3(28t) \quad \text{to } 84$$

$$48t + 18 = 84t$$

$$18 = 84t - 48t$$

$$18 = 36t$$

$$\frac{18}{36} = 0.5$$

$$a \quad t = 0 \quad S = 0 \quad t = 4$$

$$24 \times 16 + 72 = 456 \text{ m/s} \quad \checkmark$$

$$b. \quad t = 0 \quad S = 825 \quad t = 4$$

$$14 \times 16 + 20 = 244 \text{ m/s} \quad \checkmark$$

$$c \quad 48 \text{ m/s}^2 \quad \checkmark$$

4)

$$\frac{(s+5)}{s^2+8s+7}$$

$$\frac{s+5}{(s+1)(s+7)}$$

a)



This System is stable
all Poles are on left.

✓
4.
✓

b)

DC $F=0$

$$\frac{s+5}{s^2+8s+7}$$

$$\frac{5}{7}$$

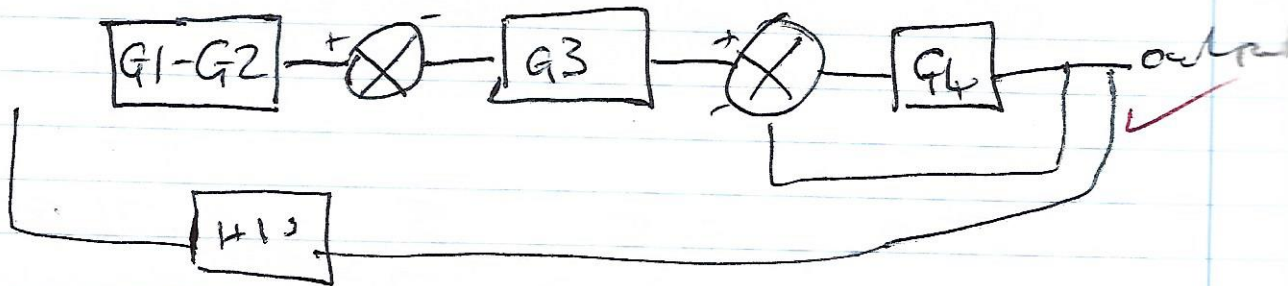
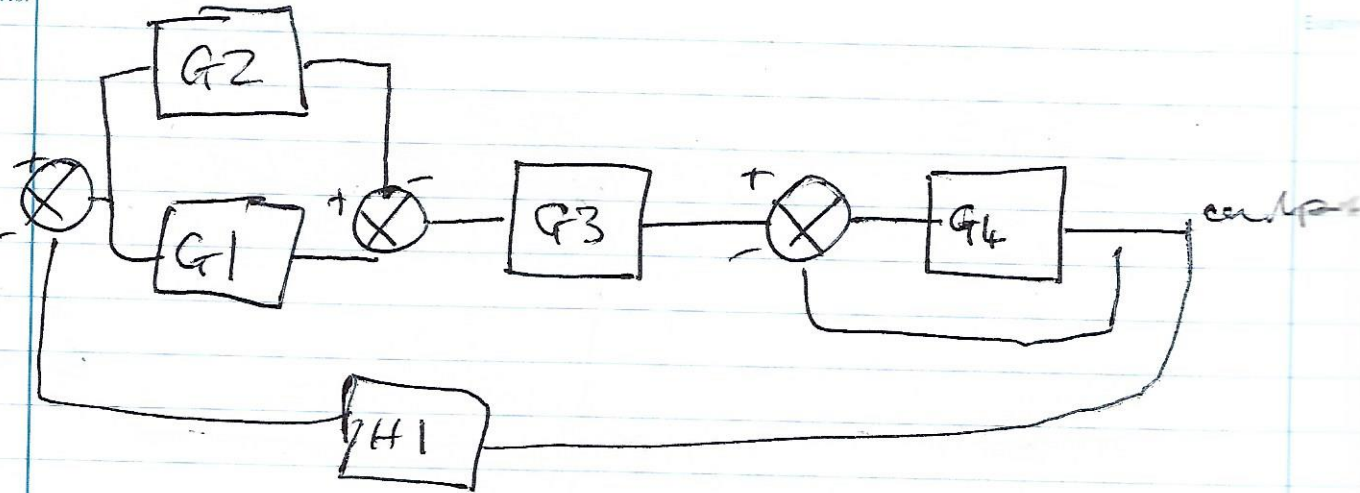
$= 0.71$ is DC response. ✓
3.

Routh Hurwitz.

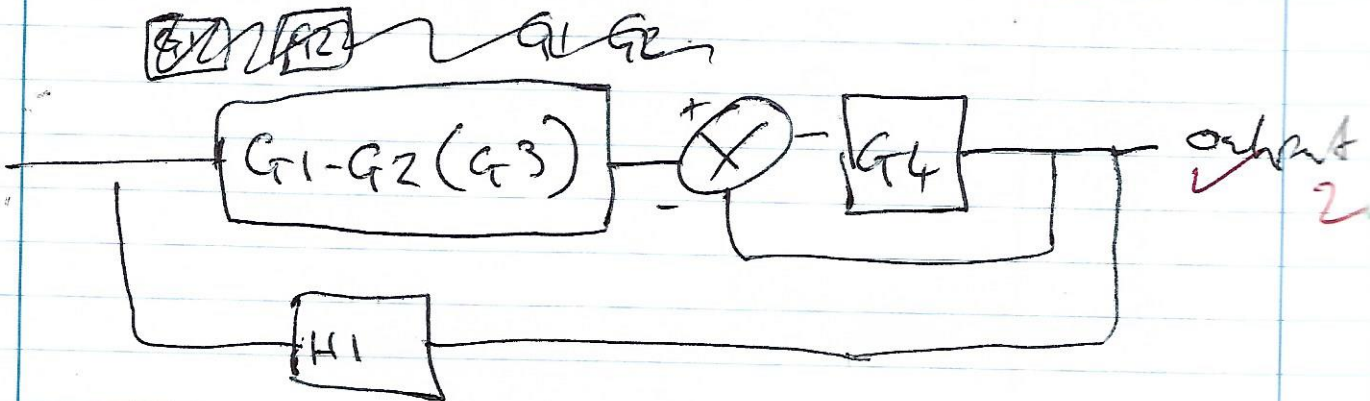
5)

SS	2	2	4	2
S4	3	0		
S3				
S2				
S1				
S0				

6



~~G1-G2~~



$$\frac{G1-G2(G3) G4}{H1}$$

$$\frac{G1-G2(G3) G4}{1+G1-G2(G3) G4 H1}$$

5
d. The System is Under damped. *Guerr?*