



Complete, fold and seal
(see note 2 below)

SURNAME: Mohamed

FORENAME(S): Ibrahim
Babiker

Examination Answer Books

12 Pages

Instructions to Candidates

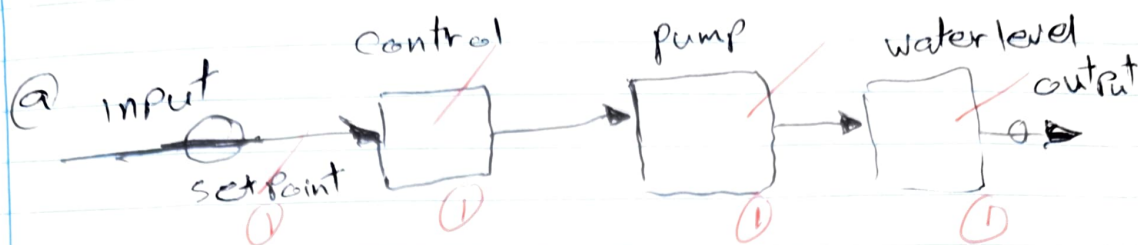
1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense 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	MOH19849052
2	Title of Examination Paper	Dynamics Control and Instruments
3	Module Code	G0FF4002
4	Date and Time of Examination	12.05.26
5	Examination Venue	68860
6	Seat Number	F5
7	Number of Answer Books handed in	1

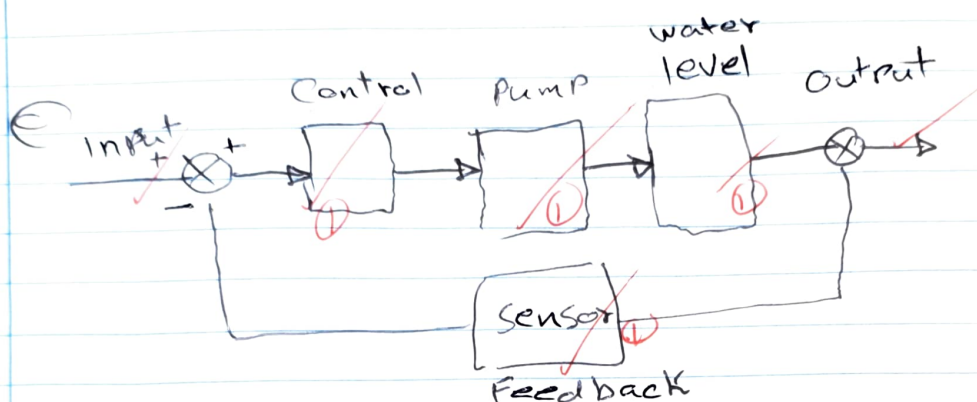
List the numbers of the questions you have attempted	Office Use
Q1 (a)	4
(b)	1
(c)	6
(d)	9
Q2 (a)	4
(b)	1
(c)	6
(d)	9
Q3 (a)	4
(b)	3
(c)	1
Q4 (a)	4
Q5 (a)	4
(b)	6
Total	62% EN.

62% RF

Q1

Q1(a)
4

(b) The system never responded to any external disturbance because there is no feedback to correct the error. ①

Q1(b)
1Q1(c)
6

(d) $G(s) = \frac{5}{(s+3)}$

Q1(d)
(i) 4

(i) $T(s) = \frac{G(s)K_b}{1 + G(s)K_b} = \frac{5K_b}{s+3} \div \frac{1 + \frac{5K_b}{s+3}}$

$T(s) = \frac{5K_b}{s+3} \div \frac{(s+3) + 5K_b}{s+3}$

$T(s) = \frac{5K_b}{s+3+5K_b}$

(ii)

Steady state $R(s) = \frac{100}{s}$

$R(s) = T(s) \cdot R(s)$

Q1(d)
(ii) 1

Pro

$$Y_{(S)} = I_S \cdot R_S = \frac{5K\Omega}{S+3+5K\Omega} \cdot \frac{100}{S} \quad \checkmark \textcircled{1}$$

Q1(d)
(ii) 4

$$Y_{(S)} = \frac{500K\Omega}{(S+3+5K\Omega)S} \quad \checkmark \textcircled{1}$$

$$S+L_{SS} = \lim_{S \rightarrow 0} S \cdot \frac{500K\Omega}{S(S+3+5K\Omega)} \quad \checkmark \textcircled{1}$$

$$L_{SS} = \lim_{S \rightarrow 0} \frac{500K\Omega}{S+3+5K\Omega} \quad \checkmark \textcircled{1}$$

Q2 $w = m \cdot g$ $w = 6 \times 9.81 = \underline{\underline{58.86 \text{ N}}}$

① $w_x = m \cdot g \sin \theta = 6 \times 9.81 \sin 20^\circ = \underline{\underline{20.13 \text{ N}}}$

$w_y = m \cdot g \cos \theta = 6 \times 9.81 \cos 20^\circ = \underline{\underline{55.31 \text{ N}}}$

$F_f = \mu \cdot m \cdot g \cos 20^\circ = 0.25 \times 6 \times 9.81 = \underline{\underline{14.72 \text{ N}}}$
Error in calculating force of friction

$F_{\text{net}} = a m$

$F - F_f - w_x = a m$ ✓

error carried over
 $40 - 14.72 - 20.13 = 6a$
 $5.15 = 6a$

$a = \underline{\underline{0.86 \text{ m/s}^2}}$ ✓

② $G_{(s)} = \frac{1}{ms+b}$

at steady state $s = 0$ $G_{(s)} = \frac{1}{b}$

$G_{ss} = f_{ss} = V \cdot b$

$1.5 \times 0.4 = \underline{\underline{0.6 \text{ N}}}$ ✓ ①

$F_{ss} = f_c + Vb + w_x = 14.72 + 20.13 + 0.6$ ✓ ①
Error carried over from (4)

$F_{ss} = \underline{\underline{35.46 \text{ N}}}$ ✓ ①

Q2(a)
3

Q2(b)
(c) 4

$$\textcircled{1} \quad Q_{(0)} = \frac{1}{0.4} = \frac{1}{0.4} = 2.5 \text{ m/s/m} \quad \textcircled{2}$$

at steady stat ~~to~~ mass move 2.5 m/s
for N apply $\textcircled{2}$

Q 2 (b)
(i) 4

$$\textcircled{C} \quad T = W_2 = m_2 \times g = 10 \times 9.81 = \underline{98.1 \text{ N}} \quad \times$$

Q 2 (c)
(i) 1

$$T - F - F_f - W_x = m_1 \quad \textcircled{1} \quad T - F -$$

$$\textcircled{D} \quad x = V s \quad \textcircled{1} = 6 \times 1.5 = \underline{9 \text{ m}} \quad \textcircled{1}$$

by multi scaling

Q 2 (d)

3

$$9 \times 0.02 = \underline{0.18 \text{ V}} \quad \textcircled{1} \quad \text{output}$$

Q3 (a) Zero $S + 3 = 0$

$$S = -3 \quad (1)$$

Poles, $S + 4 = 0 \Rightarrow S = -4 \quad (1)$

Poles, $S^2 + 3S + 6 = 0$

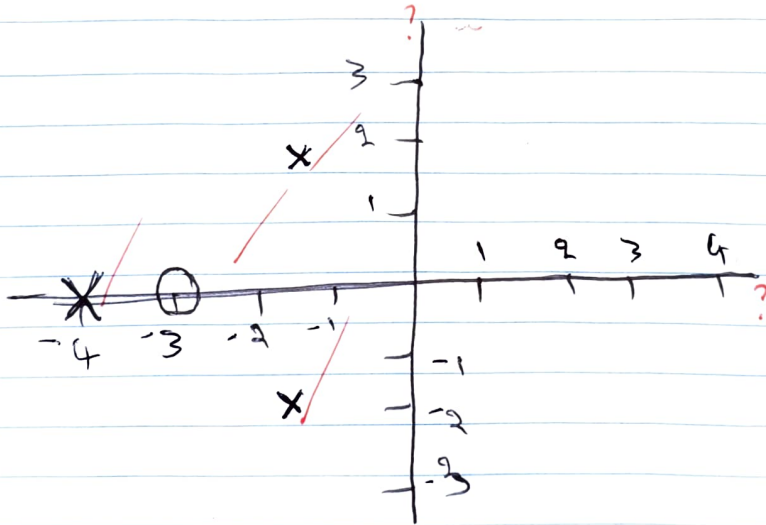
$$S = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$S = \frac{-3 \pm \sqrt{3^2 - 4 \times 1 \times 6}}{1 \times 2}$$

$$= \frac{-3 \pm \sqrt{9 - 24}}{2} = \frac{-3 \pm \sqrt{-15}}{2}$$

$$S = -\frac{3}{2} + j\frac{\sqrt{15}}{2} \quad \text{and} \quad -\frac{3}{2} - j\frac{\sqrt{15}}{2}$$

$$\underline{-1.5 + j1.94} \quad \text{and} \quad \underline{-1.5 - j1.94} \quad (1)$$



(c) open loop system is stable all value small than zero. (1)

(d) $T(s) = \frac{G(s)}{1 + G(s)}$

sub $T_s = \underline{\hspace{2cm}}$

Q3 (a)

4

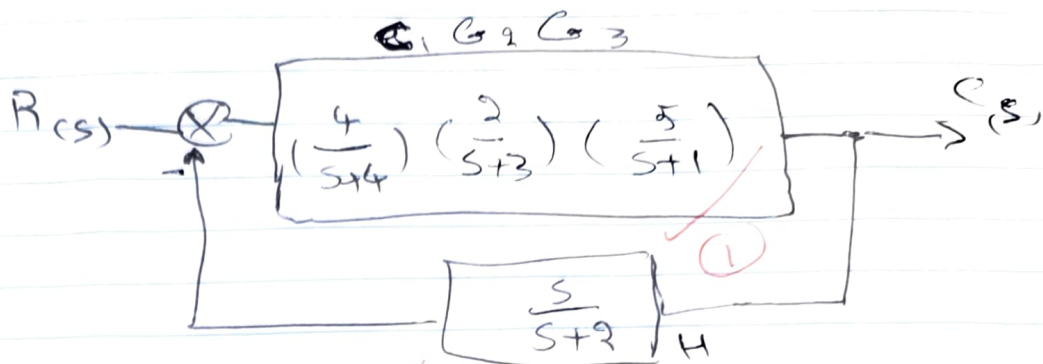
Q3 (b)

3

Q3 (c)

1

Q4



$$Y(s) = \frac{G_1 G_2 G_3}{R(s) + (G_1 G_2 G_3) H}$$

$$R(s) + (G_1 G_2 G_3) H$$

$$\frac{40}{(s+4)(s+3)(s+1)}$$

$$1 + \left(\frac{40}{(s+4)(s+3)(s+1)} \right) \frac{s}{s+2}$$

Q4

(a)

4

Q5 (a)

$$H(s) = \frac{V_o(s)}{V_{in}(s)} \quad \checkmark \quad (1)$$

$$G(s) = \frac{C(s)}{R(s)C(s)} \quad \perp$$

$$T = \frac{C(s)}{1 + G(s)H(s)} \quad \checkmark$$

$$T = \frac{\frac{C(s)}{R(s)C(s)}}{1 + \frac{C(s)}{R(s)C(s)}}$$

(ii) stat circuit low pass capacitor Q5 (a)
(ii) 2
block low frequency & take
high frequency to ground

(b)

$$\omega_n = \sqrt{\frac{1}{LC}} = \sqrt{\frac{1}{2 \times 25 \times 10^{-8}}} = \underline{\underline{141.42 \text{ Rad/s}}}$$

$$\omega_d = \omega_n \sqrt{1 - \zeta^2}$$

$$\frac{R}{L} = 2\zeta\omega_n = \frac{150}{2} = 2\zeta \cdot 141.42$$

$$\zeta = \frac{75}{282.84} = \underline{\underline{0.266}}$$

$$\omega_d = \omega_n \sqrt{1 - \zeta^2} = 141.42 \sqrt{1 - 0.266^2} = \underline{\underline{136.33}}$$

$$\omega_d = \underline{\underline{136.33 \text{ Rad/s}}}$$

(17)

DC input at stat ~~sta~~ capacitor open (iii) !
The circuit no current flow = 0 (i)

(18)

$$V_{t+1} = V_0$$

$$T_{sr} \lim_{s \rightarrow -}$$

Q5(b)

(iii) !

(iv) !



Llenwch, plygwch a seliwch
(gweler nodyn 2 isod)

CYFENW: _____

ENW(AU) CYNTAF:

1. Rhewch yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhewch eich enw yn y lle a ddarparwyd ar y dde, plygwch ef a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.
3. Rhaid i'r atebion fod mewn llawysgrifen ddarllenadwy. Gall yr Arholwyr naill ai anwybyddu sgrïpt annarllenadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddynt.
6. Ni ddylid rhwygo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.
7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda'i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwyliwr/gwylwyr.
8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

1	Rhif Myfyriwr	
2	Teitl y Papur Arholiad	
3	Cod y Modwl	
4	Dyddiad ac Amser yr Archoliad	
5	Lleoliad yr Arholiad	
6	Rhif Sedd	
7	Nifer y Llyfrau Atebion a gyflwynwyd	

[illegible]

(See the other side for English version)