PROGRAM	:	NATIONAL DIPLOMA *ENGINEERING: COMPUTER SYSTEMS* *ENGINEERING: ELECTRICAL*
SUBJECT	:	**CONTROL SYSTEMS 2**
CODE	:	**ASY211**
DATE	:	SUPPLEMENTARY EXAMINATION 18 JULY 2018
DURATION	:	08:00 - 11:00
WEIGHT	:	40 : 60
FULL MARKS	:	100
TOTAL MARKS	:	100

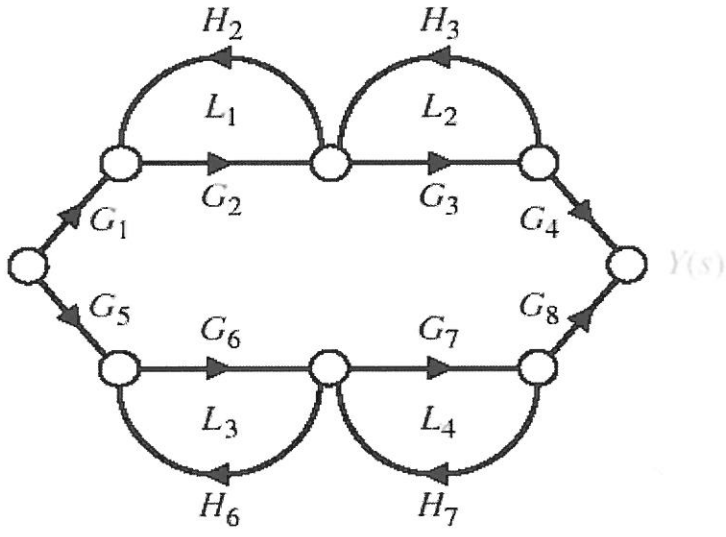
EXAMINER	:	DR THOKOZANI C SHONGWE
MODERATOR	:	MR DR VAN NIEKERK 2330
NUMBER OF PAGES	:	6 PAGES, INCLUDING 2 SEMILOG GRAPH PAPERS AND 1 FORMULAE SHEET

INSTRUCTIONS	:	CALCULATORS ARE PERMITTED (ONLY ONE PER STUDENT)
	:	USE ONLY THE ANSWER SHEET PROVIDED WITH THIS PAPER

INSTRUCTIONS TO CANDIDATES:

1. 100 MARKS = 100%
2. ATTEMPT ALL QUESTIONS.
3. THEORY TYPE QUESTIONS MUST BE ANSWERED IN POINT FORM BY CAREFULLY CONSIDERING THE MARK ALLOCATION.
4. QUESTIONS MAY BE ANSWERED IN ANY ORDER, BUT ALL PARTS OF QUESTION MUST BE KEPT TOGETHER.
5. ALL DIAGRAMS AND SKETCHES MUST BE DRAWN NEATLY AND IN PROPORTION.
6. ALL DIAGRAMS AND SKETCHES MUST BE LABELLED CLEARLY.
7. ALL WORK DONE IN PENCIL EXCEPT DIAGRAMS AND SKETCHES WILL BE CONSIDERED AS ROUGH WORK.
8. NOTE: MARKS WILL BE DEDUCTED FOR WORK WHICH IS POORLY PRESENTED.
9. NEGATIVE MARKING APPLIES IF YOUR ANSWER DOES NOT COMPLY WITH THE DETAIL REQUIRED AS REQUESTED IN CERTAIN QUESTIONS.

QUESTION 1

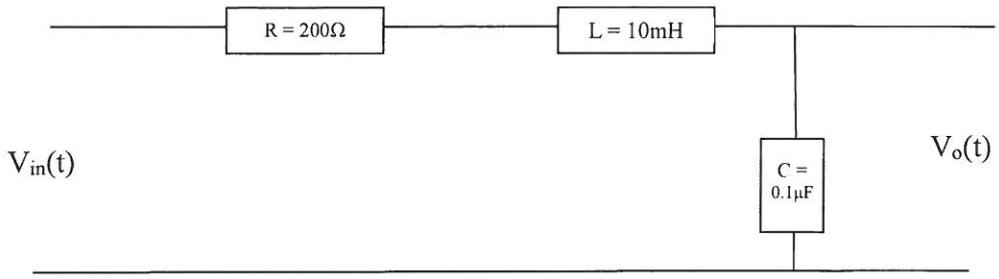


Determine the transfer function of the diagram above, using **Mason's Rule.**

[20]

QUESTION 2

Consider the passive network in the figure below, and



(a) determine the transfer function of the passive network (10)

(b) find the transient response $V_0(t)$, if $V_{in}(t)$ is a unit step. (20)

(c) draw the bode plots (both phase and magnitude versus frequency) of the transfer function. **DO NOT USE THE STRAIGHT LINE APPROXIMATION METHOD.** (10)

[40]

QUESTION 3

Find the transient response ***C(t)*** of a system with a transfer function:

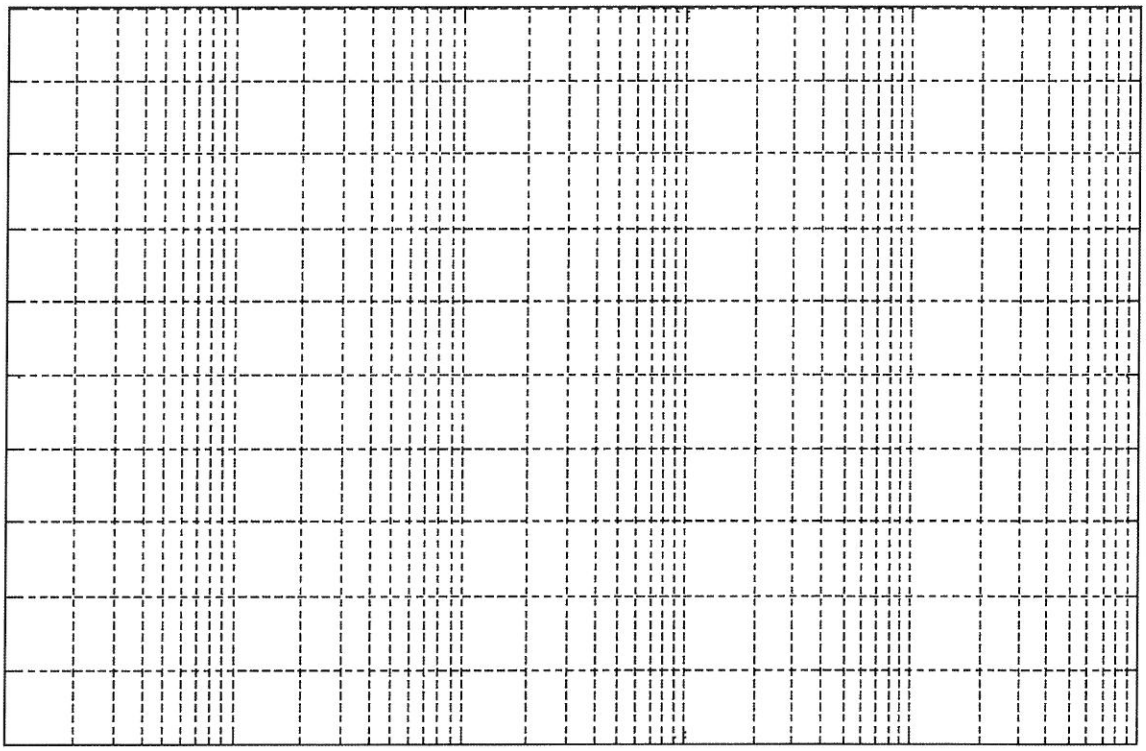
$$G(p) = \frac{C(p)}{R(p)} = \frac{3}{p^2+7p+3} \quad ,$$

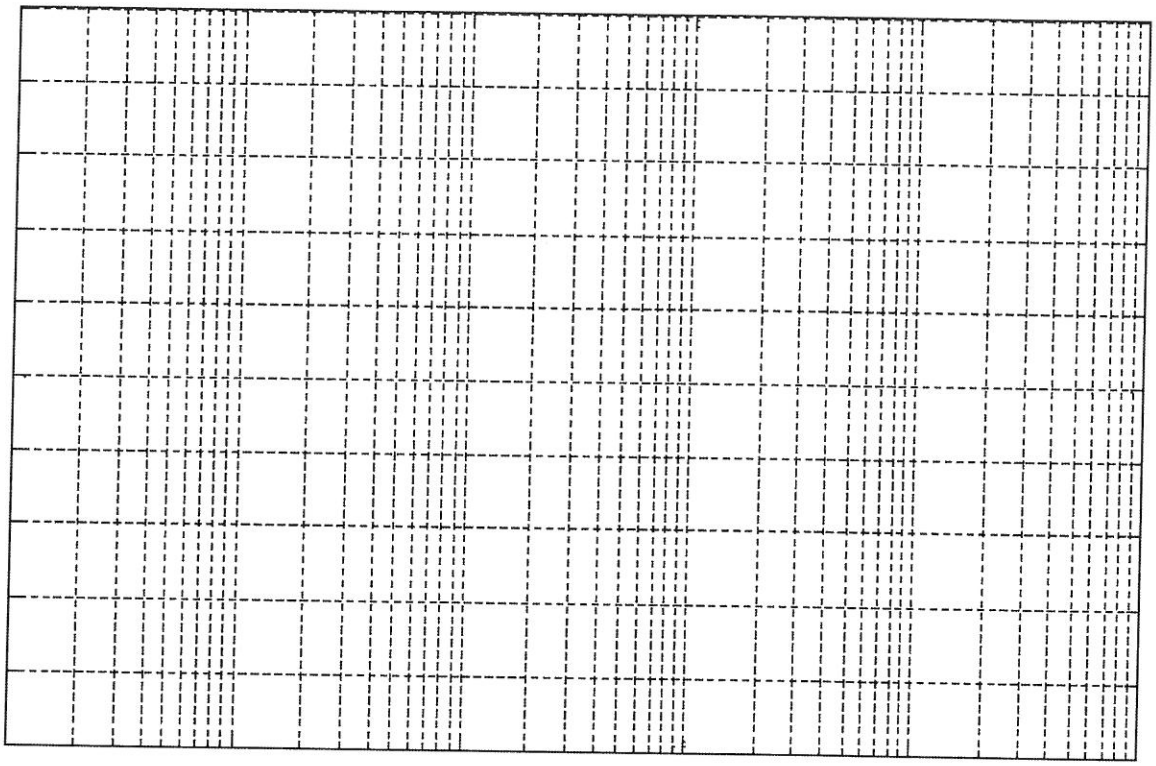
(a) Subjected to a 25 V ramp input. (20)

(b) Subjected to a unit step input. (20)

[40]

TOTAL MARKS : 100





Laplace Transforms

TIME FUNCTION f(t)	LAPLACE FUNCTION F(p)
Unit impulse	1
Unit step	$\frac{1}{p}$
Unit ramp	$\frac{1}{p^2}$
Unit parabolic	$\frac{1}{p^3}$
Exponential (e^{-at})	$\frac{1}{p+a}$
Sinusoidal ($\sin(\omega t)$)	$\frac{\omega}{p^2+\omega^2}$
Co-sinusoidal ($\cos(\omega t)$)	$\frac{p}{p^2+\omega^2}$
$\frac{1}{(n-1)!}t^{n-1}e^{-at}$	$\frac{1}{(p+a)^n}$
$e^{-at}\sin(\omega t)$	$\frac{\omega}{(p+a)^2+\omega^2}$
$e^{-at}\cos(\omega t)$	$\frac{p+a}{(p+a)^2+\omega^2}$