

MARKING CRITERIA AND STUDENT FEEDBACK

This section details the assessment criteria. The extent to which these are demonstrated by you determines your mark. The marks available for each criterion are shown. Lecturers will use the space provided to comment on the achievement of the task(s), including those areas in which you have performed well and areas that would benefit from development/improvement.

Common Assessment Criteria Applied	Marks available	Marks awarded
1. Research-informed Literature Extent of research and/or own reading, selection of credible sources, application of appropriate referencing conventions.		
Some referencing at end of doc but missing from body of the text. There is evidence of reading.	10	5
2. Knowledge and Understanding of Subject Extent of knowledge and understanding of concepts and underlying principles associated with the discipline.		
Unfortunately there are several examples of confusion such as in Task 2 (b.i) and again in task 2 d).	50	20
3. Analysis Analysis, evaluation and synthesis; logic, argument and judgement; analytical reflection; organisation of ideas and evidence		
Little evidence and then superficial.	10	2
4. Practical Application and Deployment Deployment of methods, materials, tools and techniques; application of concepts; formulation of innovative and creative solutions to solve problems.		
You have managed to get Matlab. However you did not correctly enter the T.F in T4(i) - missing 0th term.	25	9
5. Skills for Professional Practice Attributes in professional practice; individual and collaborative working; deployment of appropriate media; presentation and organisation.		
Unfortunately you have mixed fonts. - and poorly laid out structure. Though you do now use their power.	5	2

Assignment Mark Overall (Assessment marks are subject to ratification at the Exam Board. These comments and marks are to give feedback on module work and are for guidance only until they are confirmed.)	Late Submission Penalties (tick if appropriate)		38 %
	Up to one-week late		
	Over one week late		

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KNC/HND in Electrical

and Electronic

Engineering

Dynamics, Control and

Instrumentation

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M4X01405

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Task 1

- a) Stress is the force of that gradient exerts massive stress on the structures. The force of that gradient exerts massive stress on the structures. Strain can be positive or negative, although dimensionless; strain sometimes is expressed in units such as mm. A measurement system that is used to measure stress and strain is a strain gauge. A strain gauge measures the resistance of the strain of an object in both its faces (length and depth). First you measure the object at the two selected points, then you place the two strain gauges onto the two points then begin the strain test and leave the object at tension over a time scale. When the time is up remove the gauges from the object. Then retrieve accurate measurements from the two points on the objects, which you then compare the original measurements of the object points to the new measurements, and then compare the differences of the stress and strain of the material.

b)

$$E = 210 \text{ GPa}$$

$$\text{Applied Forces} = 1.5 \text{ MN}$$

$$= 2.5 \text{ MN}$$

$$\text{Area} = 0.1 \text{ m}^2 \quad \times$$

$$\sigma = \frac{1.5 \times 10^6}{5 \times 10^{-3}} = 300 \times 10^6 \text{ Pa}$$

$$E = \frac{\sigma}{\epsilon} \quad \epsilon = \frac{\sigma}{E} = \frac{300 \times 10^6}{210 \times 10^9} \quad \checkmark$$

$$= 1.428571429 \times 10^{-3} \quad \checkmark$$

$$= 1.429 \times 10^{-3}$$

$$\epsilon = \frac{\Delta x}{x} = \Delta X = \epsilon x$$

$$= 1.429 \times 10^{-3}$$

$$\approx 1.429$$

$$\text{Extension} = 1.429 \times 10^{-3} \times 2 = 2.858 \times 10^{-3}$$

$$\sigma = \frac{2.5 \times 10^6}{5 \times 10^{-3}} = 500 \times 10^6 \text{ Pa}$$

$$E = \frac{\sigma}{\epsilon} \quad \epsilon = \frac{\sigma}{E} = \frac{500 \times 10^6}{210 \times 10^9}$$

$$= 2.380952381 \times 10^{-3}$$

$$\text{Extension (under 1.5MN)} = 2.381 \times 10^{-3} \times 1.5 \times 10^6$$

$$= 3.572 \times 10^{-3}$$

$$\text{Extension (under 2.5MN)} = \left(\frac{2.381 \times 10^{-3}}{1.5 \times 10^6} \right) \times 2.5 \times 10^6$$

$$= 3.97 \times 10^{-3}$$

Task 2

- a) **Set point** – Is a target value for an essential variable. E.g. setting an air conditioner to a maximum of 20°C.

Overshoot – Is the occurrence of a signal exceeding its target.

Plant - A system is a combination of components that act together to perform a specific function.

Controlled variable - the quantity that must be maintained at set value.

Controller - is a device in the form of a microprocessor or computer, which monitors and physically changes the operating conditions of a given dynamic system.

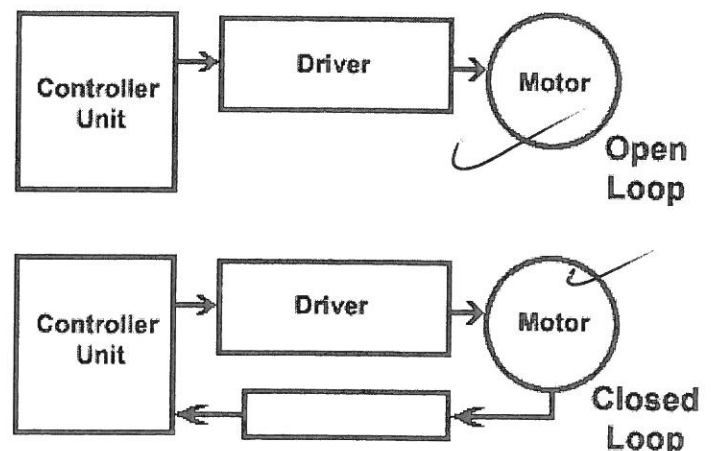
Control law - is a mathematical formula used by the controller to determine the output that is sent to the plant.

- b) The function of a linear time invariant differential equation system is defined as the ratio of Laplace transform of the output (response function) to the Laplace transform of the input (drive function) under the assumption that all initial conditions are zero.

- Washing machine
- Heating system (boiler)
- Air conditioner.

- c) **Open-Loop control system:** Is a system in which the output has no effect on the input. In other words, the output is neither measured nor fed back with the input. An example is a washing machine.

Closed-Loop Control System: is a system in which the output has an



effect on the input, in a way that can maintain the value of the output. An example is a room temperature control system. ✓

- d) There are many ways that a closed loop system can outperform an open loop system, one way it can outperform an open loop system is that it can help improve the stability of an unstable system. It can also help to produce a reliable and consistent performance unlike an open loop system. Another advantage of a closed loop system outperforming an open loop is that it prevents external disturbances in the process. ✗

Task 3

a)

Linear displacement- is an electrometrical device which is used to convert mechanical motion or vibrations into a variable electrical current or voltage. This device controls the output of the voltage. |

Rotation displacement- Is a transducer which provides alternating current output voltage. In other words it is the opposite of the linear displacement transducers. /

Pressure- A sensor/transducer that can measure pressure (Pa) is a strain gauge. A strain gauges electrical resistance can vary in proportion to the amount of strain on the device.

Presence (of a metallic item)- "Presences" sensors detect the distance or presences on an object. There are numerous types of sensing devices such as; ultrasonic sensors, inductive proximity sensor and Presence sensing safety device. |

Vibration- A sensor/transducer that can measure vibration is an accelerometer. Accelerometers are full-contact transducers typically mounted directly on high-frequency elements, such as gearboxes or spinning blades. |

- b) The key advantage of a 4-20mA system is that you can use a variable amount of voltages unlike a 0-10V system where you are restricted to the amount of voltage that you can use. It also has a rugged signal with low electromagnetic susceptibility and it can be run over long distances with minimal signal losses compared to voltage type signals. 3

Task 4

a) An unrestrained linear system is stable if the output response is bounded for all bounded inputs. Otherwise it is said to be unstable. ✓

b)

i)

$$\text{sysN} = [-1 \ -3 \ 4]$$

```
sysD = [-1 -9 -26 -24]
c= tf([sysN] , [sysD])
Nroots= roots([-1 -3 4])
Droots= roots ([-1 -9 -26 -24])
pzmap(c)
grid on
```

sysN =

1 3 -4

sysD =

1 9 26 24

C =

$$\frac{(s^2 + 3s - 4)}{(s^3 + 9s^2 + 26s + 24)}$$

Continuous-time transfer function.

Nroots =

-4

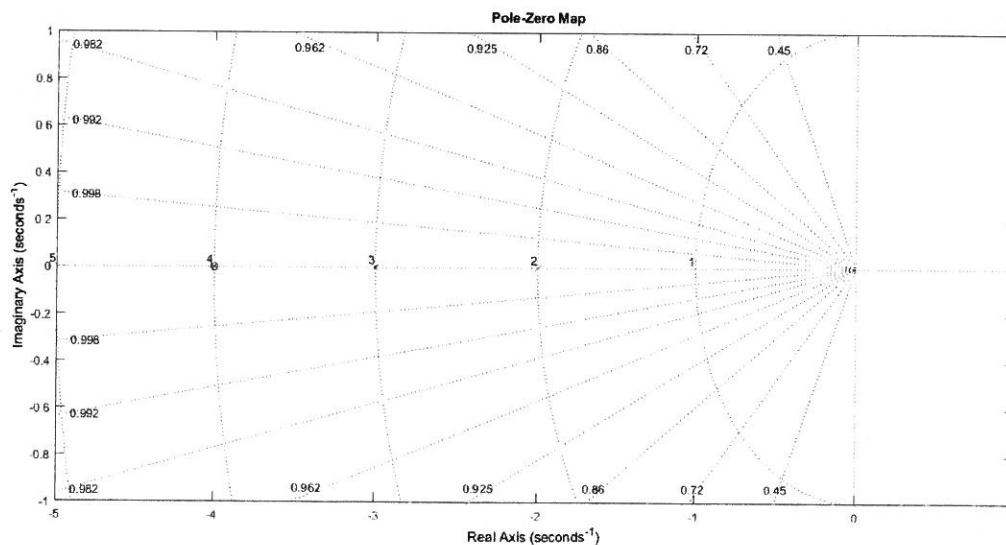
1

Droots =

-4.0000

-3.0000

-2.0000



Graph to
show Task 4,
question B
part i.)

ii)

```
sysN = [-1 2]
sysD = [-1 -5 -4]
c= tf ([sysN] , [sysD])
Nroots= roots ([sysN])
Droots= roots ([sysD])
pzmap(c)
grid on
```

sysN =

1 -2

sysD =

1 5 4

c =

$$\frac{(s - 2)}{(s^3 + 5s^2 + 4s)}$$

Continuous-time transfer function.

Nroots =

2

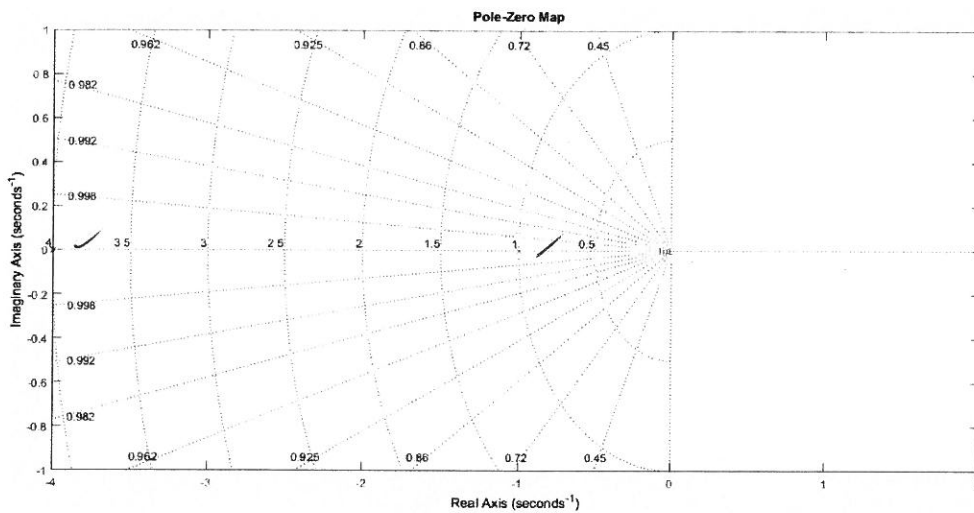
Droots =

-4

-1

0 ?

2



Graph to show Task 4,
question B part ii.)

iii)

```
sysN = [1]
sysD = [1 4 -7 -34
        -24]
C= tf ([sysN] ,
        [sysD])
```

```
Nroots= roots([sysN])
Droots= roots([sysD])
pzmap(c)
grid on
```

sysN =

1

sysD =

1 4 -7 -34 -24

Nroots =

0×1 empty double column vector

Roots =

3.0000

-4.0000

-2.0000

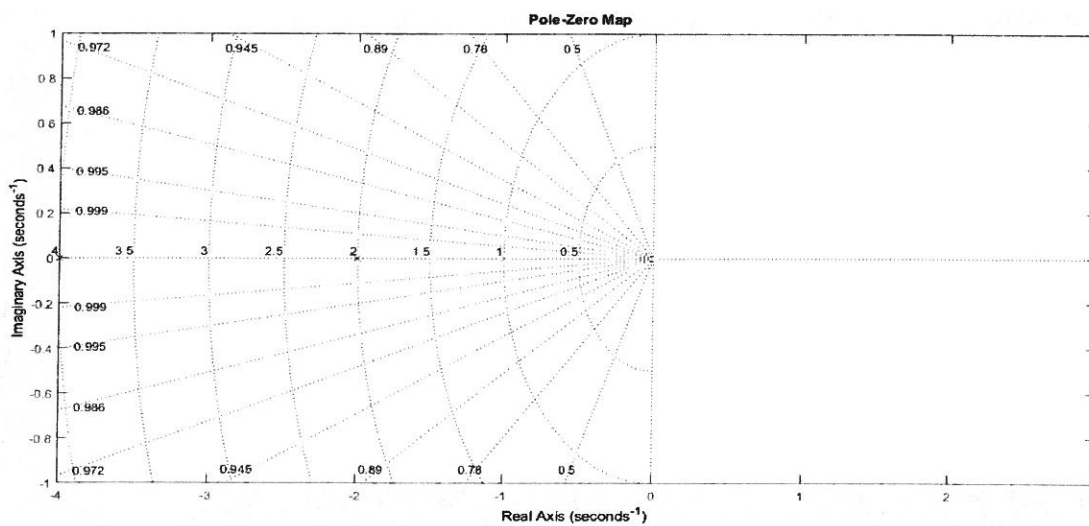
-1.0000

2

C =

$$\frac{1}{s^4 + 4s^3 - 7s^2 - 34s - 24}$$

Continuous-time transfer function.



Graph to show Task 4, question B part iii.)

2

Bibliography

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