



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2019

Marking Scheme

Technology

Higher Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.



Coimisiún na Scrúduithe Stáit

State Examinations Commission

Junior Certificate Examination, 2019

Technology

Higher Level

Afternoon, 2:00 - 4:00

Section A

Instructions:

1. Answer **Section A** (short answer questions). 100 marks
2. Answer either **(a) or (b)** from each question in **Section B**. 50 marks
3. Answer **one** question from **Section C**. 50 marks
4. Hand up this paper at the end of the examination along with answer sheets for **Section B** and **Section C**.

Centre Number

Examination Number

*Write your examination number
in the box provided on this page.*

SECTION A		For the Examiner	
No. of Questions		Mark	Total
	x	4	
	x	3	
	x	2	
	x	1	
	x	0	
	x	/	
Total (32)		Total 1:	
Disallowed		Mark	Total
	x	4	
	x	3	
	x	2	
	x	1	
Total (max 7)		Total 2:	
Section A Total (1-2):			

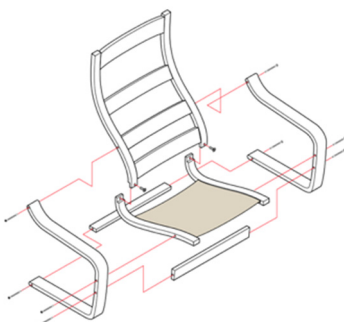
Section A Answer any 25 questions from this section - all questions carry equal marks. **100 marks**

1. A view of a chair is shown.

Name the type of view shown

and

state **one** advantage of this type of view.



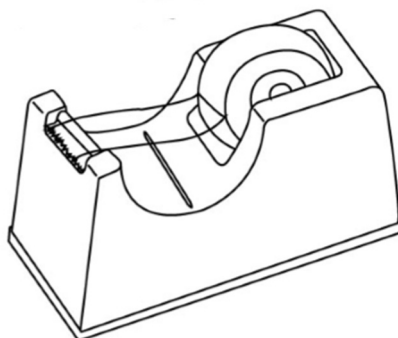
View : Isometric / Exploded

Assembly : 2 mks

Pictorial / 3D: (1 mk)

Advantage : All parts visible /
Parts visible in relation to each other
2 mks

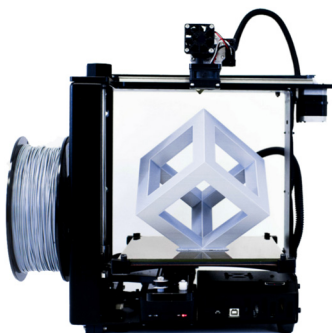
2. Use **two** rendering techniques to enhance the view of the tape dispenser shown.



Any **two** suitable rendering techniques (shadow / shading, texturing / colour)

2 x 2 mks

3. State **one** advantage and **one** disadvantage to using a 3D printer in school.



Advantage : small parts / custom parts / precision parts can be made, etc. 2 mks

Disadvantage : slow process, limited quality, limited quantity, expensive (costly), etc. 2 mks

4. State **two** reasons why DVD drives are no longer built into modern laptop computers.



(i)/(ii): Easier to download data than make DVD, faster internet speed made DVD redundant, Lower cost alternative available (USB), removing DVD reduces cost / size of laptop, DVD can be copied, etc.

2 x 2 mks

5. State the meaning of **each** of the graphics shown.



(i)



(ii)

(i): Wear ear protection 2 mks
Earphones 0 mks

(ii): Reference to WiFi signal / WiFi hot spot 2 mks

6. Explain **each** of the following terms :

Thermoplastic,

and

Thermosetting plastic.



Thermoplastic: Plastic can be reshaped by heating, reheated and reshaped, etc 2 mks
Recycle : 0 mks

Thermosetting plastic: Plastic cannot be reshaped by heating, plastic sets permanently after initial processing. 2 mks

7. State the purpose of **each** type of nut shown.



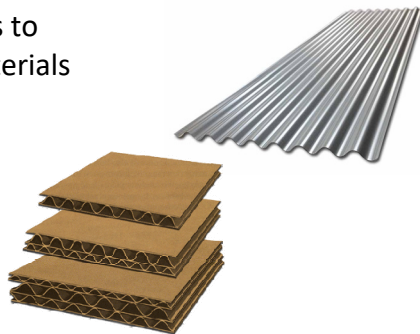
(i)

(ii)

(i): (wing nut) Allows attachment or removal of nut by hand, (no special tool required), easy to open/close by hand. 2 mks

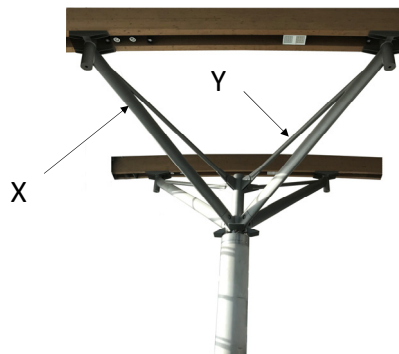
(ii): (dome nut) Caps end of threaded bar, prevents injury from exposed threaded bar (safety), enhance finish of workpiece. 2 mks

8. State **two** advantages to using corrugated materials in manufacturing.



2 x Advantage : Combines low mass with strong / rigid structure. Lower cost (cheaper) material (compared) with solid material. Shape can withstand loading better than solid material, lower cost, etc 2 x 2 mks

9. Name the forces operating on member X and on member Y in the roof support structure shown.



X : Compression (Push : 1 mk) 2 mks

Y : Tension (Pull : 1 mk) 2 mks

10. **Name** each of the tools shown

and

name a material which should be cut with that tool.



(i)



(ii)

Tool (i): Tenon / Mitre Saw 1 mk

Material: Wood 1 mk

Tool (ii) : Hack Saw 1 mk

Material: Metal / Plastic 1 mk

11. State the property of an LDR which changes with changing light levels.



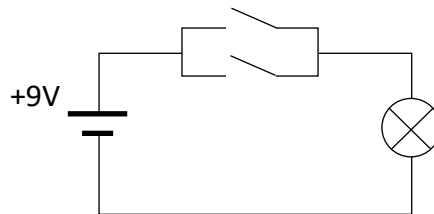
LDR

Property : Resistance
Conductivity : 2 mks

4 mks

(Light / Ohm : 0 mks)

12. Name the logic gate represented by the circuit shown.

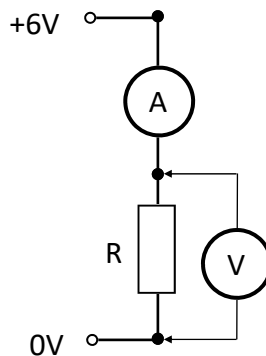


Logic Gate: OR (gate)

4 mks

13. Calculate the resistance R in the circuit shown.

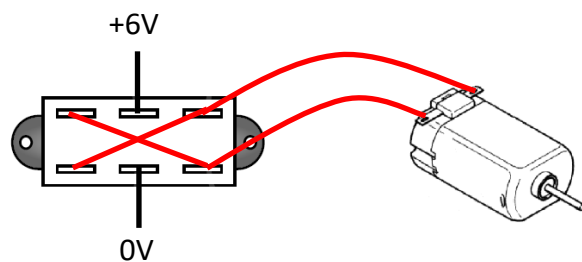
$V = 6V$, $A = 20mA$.



Calculation : $V/I = R$ (2 mks)
 $6/.02$ (2 mks)
 $6/20$ (2 mks)

Resistance : 300 (3 mks) Ohms/ Ω (1 mk)

14. Indicate clearly, on the sketch shown, how to connect the switch and motor in order to allow the motor turn clockwise or anticlockwise.

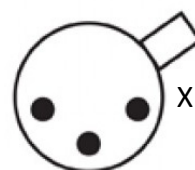
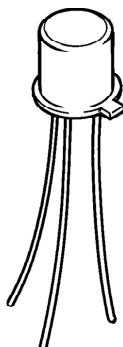


DPDT switch

DC motor

4 wires: 4 x 1 mks

15. Name the legs of the transistor labelled X and Y on the pin view shown.



X : Emitter

2 mks

Y : Base

2 mks

16. State **two** advantages to using a toothed belt over a chain drive in an inkjet printer mechanism.



2 x Advantage : Quiet operation, easy to replace, lower cost., no lubrication required

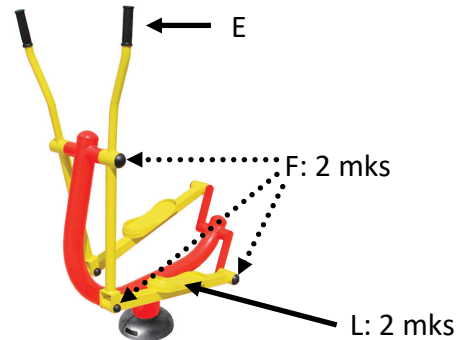
2 x 2 mks

17. The location of the effort **E** is shown on the cross trainer, show clearly the location of :

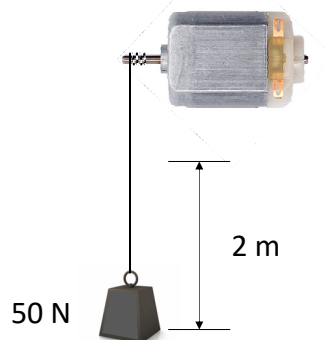
the load (**L**),

and

the fulcrum (**F**).



18. Calculate the work done, to lift the 50 N load a distance of 2 m, by the system shown.



Work: 100 4 mks

Calculation:

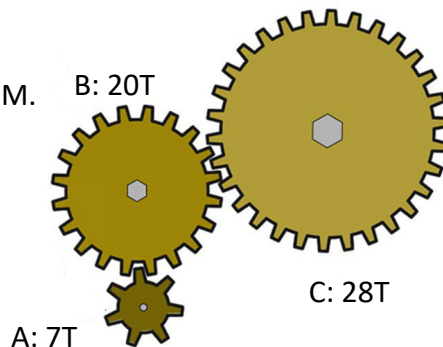
$$W = F \times d \quad (2 \text{ mks})$$

$$W = 50\text{N} \times 2\text{m} \quad (2 \text{ mks})$$

$$W = 100 \text{ Nm} \quad (2 \text{ mks})$$

19. In the gear train shown, gear A rotates at 160 RPM.

Calculate the speed of rotation of gear **C**.



Gear C: 40 4 mks

Calculation:

$$7T \times 160 \text{ RPM} = 28T \times Z \text{ RPM} \quad (2 \text{ mks})$$

$$(7 \times 160) / 28 = 40 \quad (2 \text{ mks})$$

$$\begin{aligned} \text{OP speed} &= \text{IP speed} \times \text{Driver/Driven} \\ &= 160 \times (7/28) \end{aligned}$$

(2 mks)

20. Name **two** safety features off the pillar drill shown.



(i)/(ii): Emergency stop button, Chuck guard

2 x 2 mks

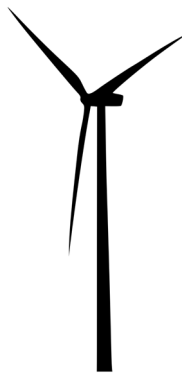
21. State **two** reasons why additives are used in processed foods.



Reason 1/2: Preservatives, increase shelf life, Flavour / colour enhancers, freshness, etc.

2 x 2 mks

22. Name **two** energy conversions taking place in a working wind turbine.



2 Energy Conversions (2 x 2 mks)

FROM	TO	mks
Kinetic	Electrical	2
Kinetic	Sound	2
Kinetic	Heat	2
Electrical	Heat	2

Ref to magnetism / light : 0 mks

23. Smart watches are an example of wearable technology.



Benefit : Convenient health monitor, use for fitness training, compact, etc.

2 mks

State **two** benefits of this type of technology.

Benefit: Provide access to Apps without need to pick up smartphone.

2 mks

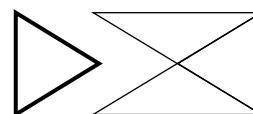
24. Name **and** sketch the structural feature which makes a Ferris wheel both strong and lightweight.



Name: Triangulation

2 mks

Sketch



2 mks

25. Smart phones contain a number of sensors, including: gyroscopes, accelerometers and biometric sensors.

State the purpose of any **one** of these sensors in a smart phone.



1 Sensor linked to correct Purpose : 4 mks

Biometric - Fingerprint / face ID
Accelerometer - is phone face up/ down, portrait or landscape mode, how fast phone moving.
Gyroscope - is phone rotating, which way phone is pointing.

26. State **two** reasons why a power adaptor (transformer) is required for portable electronic devices.



(i)/(ii): Charging/ powering a device,
Reduce voltage to 12 V/5V,
change AC current to DC current,
prevent damage from mains .

2 x 2 mks

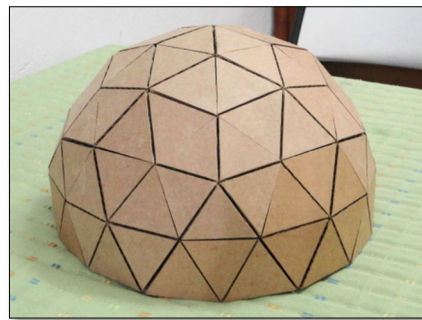
27. State **two** important features which should be considered when designing a running shoe.



(i)/(ii): Comfort, support, style,
waterproof, durability,
safety (leds), breathable,
shock absorption, Material
linked to property, etc.

2 x 2 mks

28. State **two** reasons to make a model as part of the design process.



(i)/(ii): Helps visualise final product,
test an idea, check if all parts fit/
function, check if improvements re-
quired in design, etc.

2 x 2 mks

29. State **two** ways in which a home could be made more energy efficient.

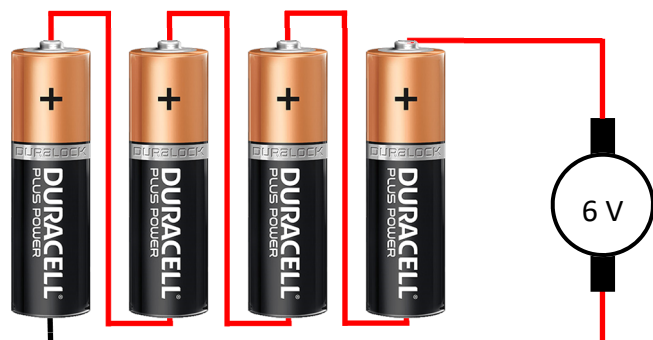


(i)/(ii): Insulate walls/roof etc.
Double / Triple glazing,
Energy efficient lights, solar panels,
draught proof house, heat pump,
timers, smart-home apps / hive,
wind turbines, etc.

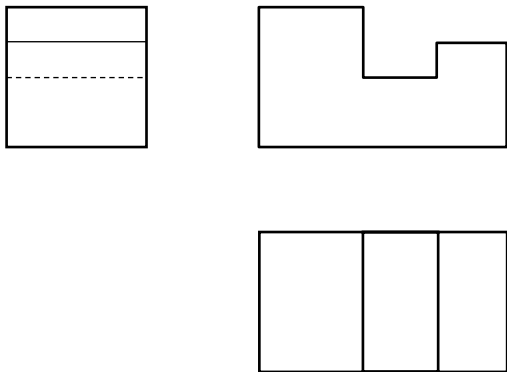
30. Indicate clearly on the sketch shown, how the four 1.5 V cells should be connected to produce 6 V.

(+) <> (-) x 4

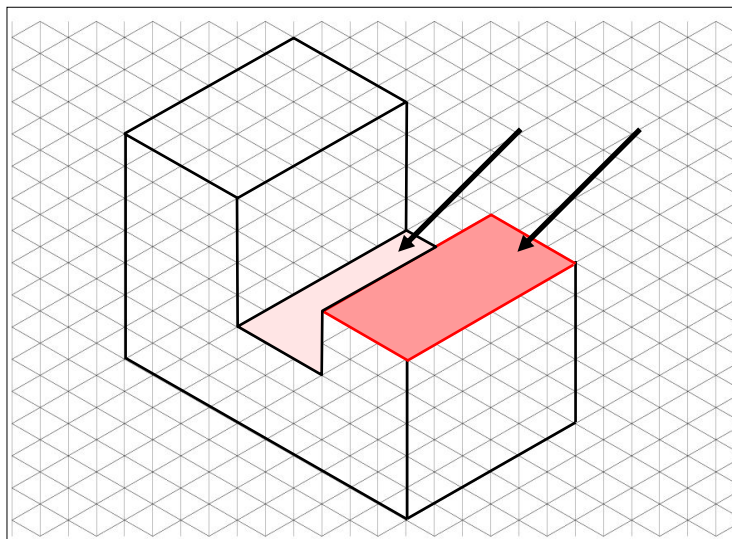
4 x 1 mks



31. An orthographic projection of a component is shown.
On the grid provided, complete the isometric view of the component.



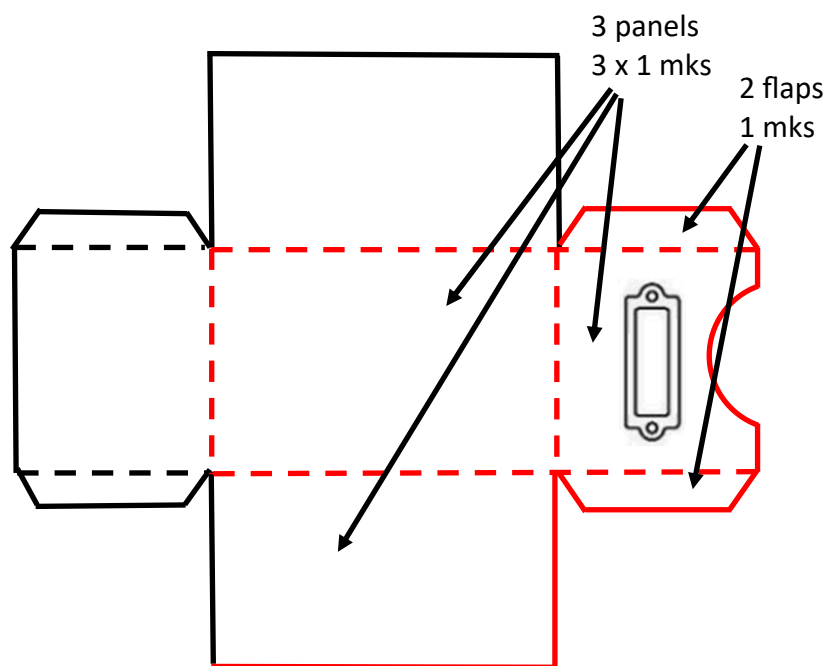
Orthographic projection



2 faces

2 x 2mks

32. Complete the development of the polypropylene storage box shown.



Completed development
(3 panels + 2x flaps)

4 mks



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination, 2019

Technology
Higher Level

Wednesday, 19 June
Afternoon, 2:00 - 4:00

Section B and Section C

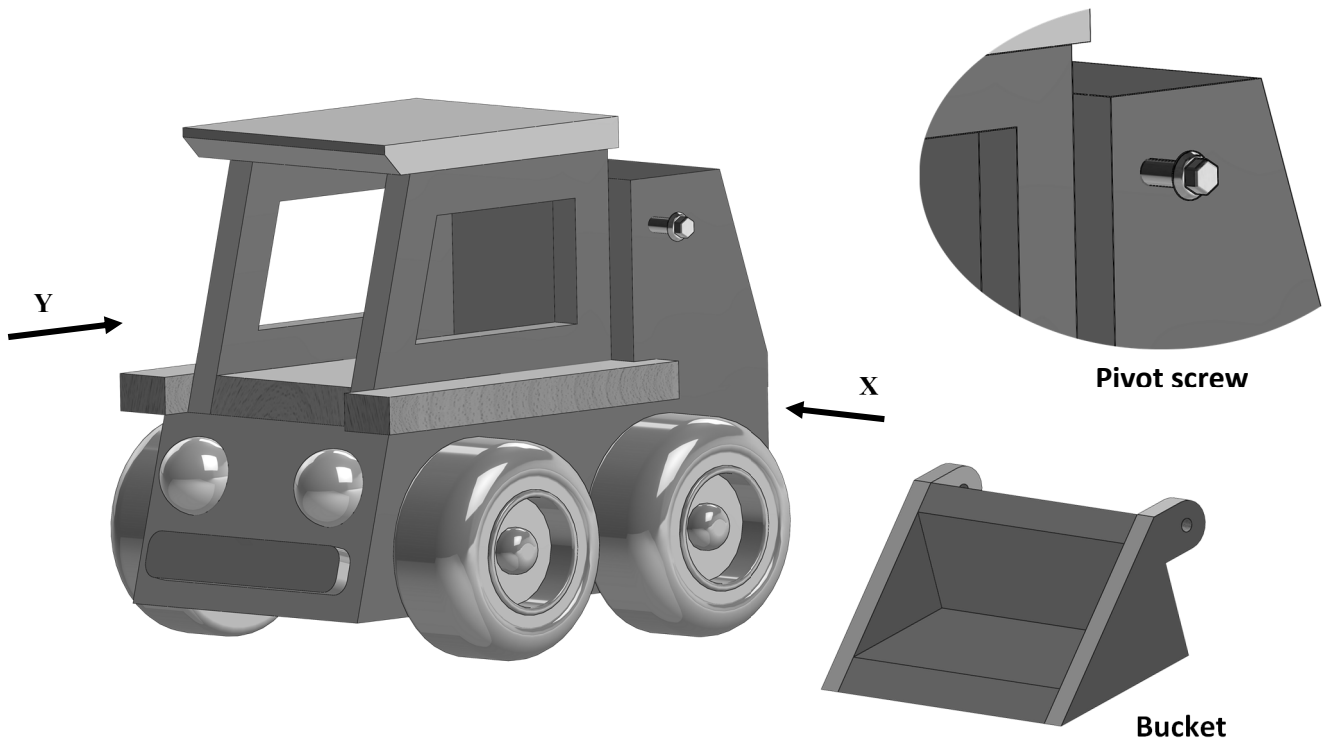
Section B - 50 marks

Section C - 50 marks

Instructions:

1. Answer either **(a)** or **(b)** from each question in **Section B**.
2. Answer **one** question from **Section C**.
3. Hand up **Section A** with your answer sheets to this paper.

1 (a) The graphic shows a sketch for a toy loader.



(i) Make well-proportioned sketches of the following views: (See Appendix).

1. An **elevation** in the direction of arrow **X**.

Correct Elevation [5 marks]

2. An **end view** in the direction of arrow **Y**.

Correct End View [5 marks]

(10 marks)

(ii) A bucket for the loader, similar to that shown, is required.

1. Suggest a suitable material from which to manufacture the bucket and give **one** reason for your choice. - *Plastic / wood / metal (or named)*

Suitable material [2 marks], reason for choice (property) [3 marks]

2. Describe, using notes and sketches, how to manufacture the bucket.

Manufacture bucket - Notes (2 process) [2 x 1marks] , sketches [3 marks]

(3D / Laser printed (1 mk) + CAD file (1 mk), sketches (3 mks))

(10 marks)

(iii) A connecting arm is required to attach the bucket to the body of the toy at the pivot shown. The arm must allow the bucket to be raised and lowered using a suitable mechanism.

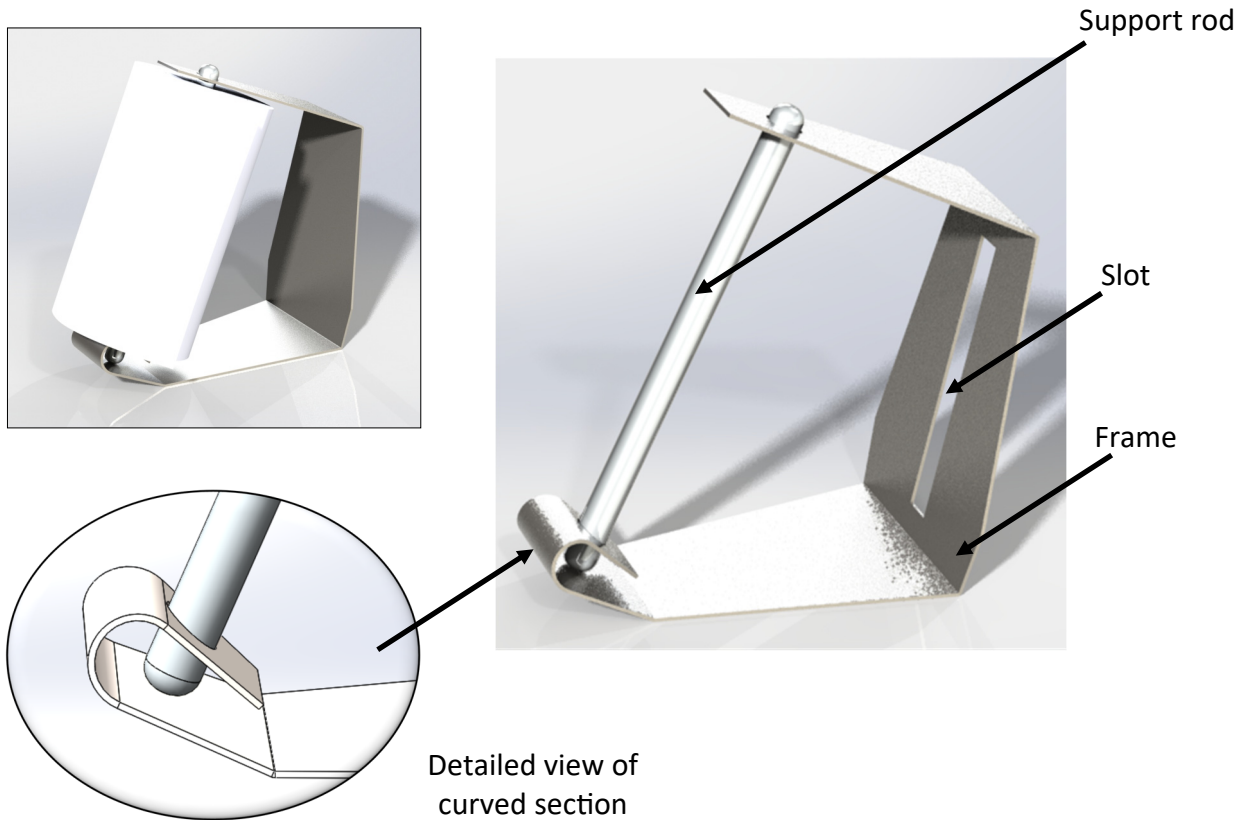
Sketch a design for a suitable connecting arm (2 mks) and mechanism (3 mks).

Suitable design sketched [2 + 3: 5 marks]

(5 marks)

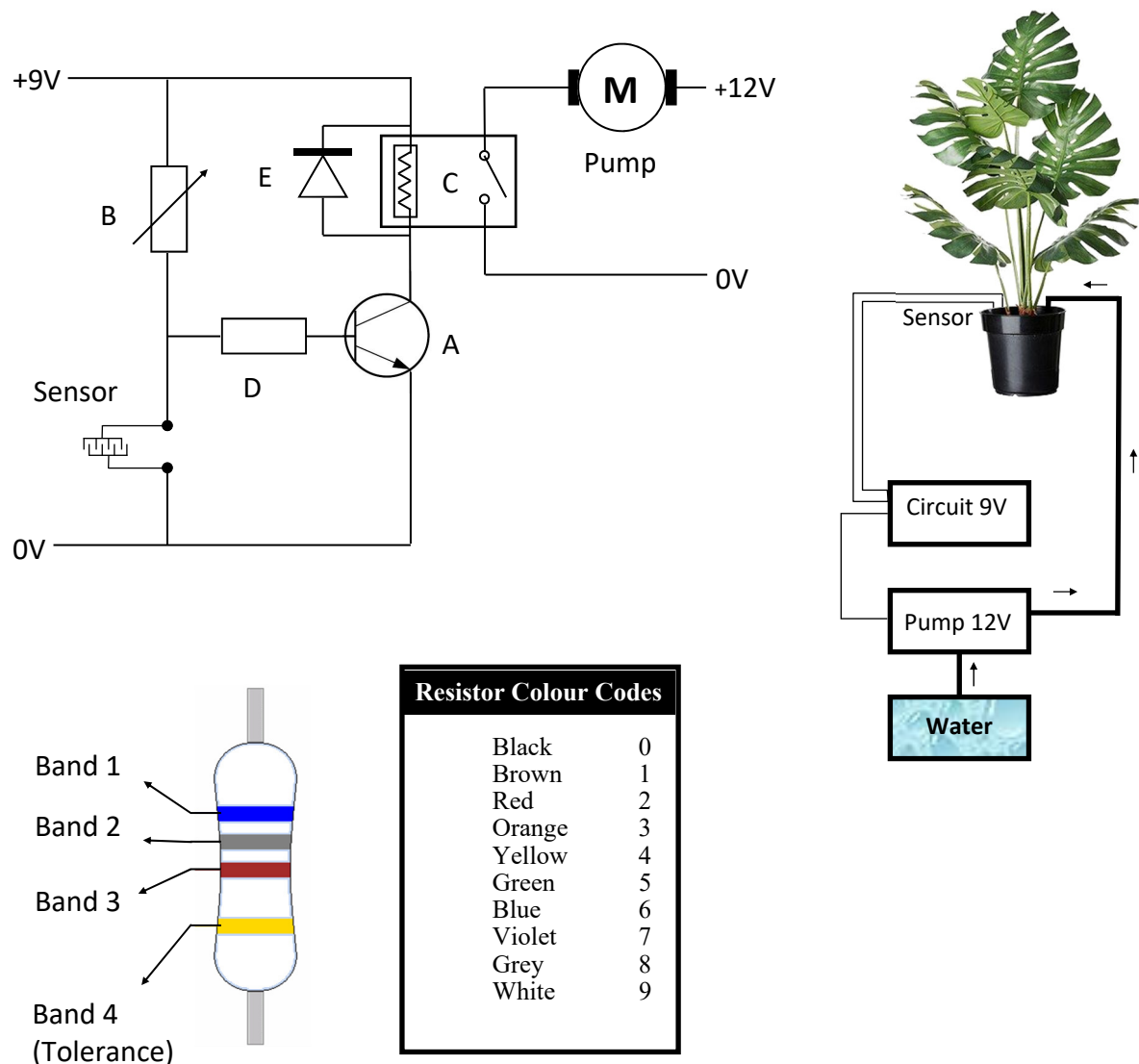
- OR -

- 1 (b) The graphics show a design for a free-standing paper roll holder.
The frame is manufactured from a single material.
The slot was added to allow the paper to exit the holder and be easily cut.



- (i) Make a well-proportioned sketch of the **development** of the holder to include the slot and holes. (See appendix).
Indicate clearly on your sketch the position of all cutting and bend lines.
Correct Development sketched, with bend and cutting Lines, in proportion.
6 panels: 6 x 1 marks, correct location of 2 x holes: 2 x 1 marks, correct location of exit slot: 1 marks, sketch in proportion: 1 mark.
(10 marks)
- (ii) 1. Explain, using sketches, the steps required to manufacture the **holder** from a suitable named material.
Manufacture [3 steps x 2 mks: 6 marks] - marking out, cutting, bending (process), removing slot. No sketch : max 3 mks
2. Describe, using sketches, how to produce the curved section shown.
Production process described [2 x 2 mks: 4 marks]
Plastic: Heat & bend (former), Metal: Beat around former.
(10 marks)
- (iii) When testing the holder, it was found that it was difficult to remove and cut the paper through the slot shown.
Describe, using sketches, a suitable modification to solve this problem.
Suitable modification (cutting edge/ modified slot/ holder) sketched [5 marks]
(5 marks)

2 (a) The circuit shown will be used to automatically water a plant when dry soil is detected.



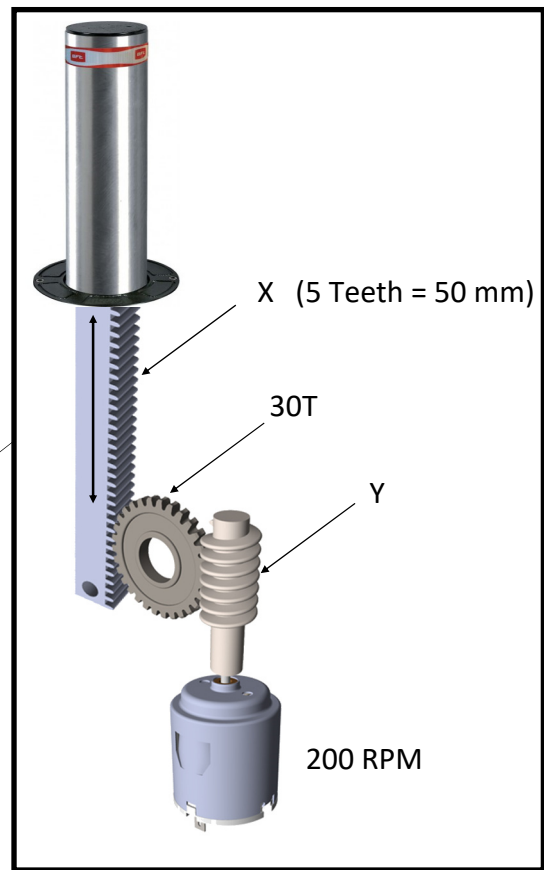
- (i) Name the components labelled **B** and **C** in the circuit. (6 marks)
B: Variable resistor [3 marks], C: Relay [3 marks]
- (ii) State the functions of components **A** and **B** in the circuit. (6 marks)
A: act as a switch / amplify small change in PD signal [3 marks]
B: act in PD to set trigger level of sensor / adjust sensitivity [3 marks]
- (iii) Resistor **D** has a value of 2200Ω and a tolerance of $\pm 5\%$. Using the table provided, state the colours of the four bands on resistor D. (8 marks)
Red, Red, Red, Gold [4 x 2 marks]
- (iv) Name component **E** and explain why it is required in this circuit. (5 marks)
E: Diode [3 marks], Protect transistor from damage by relay, Allow current flow around coil, [2 marks], etc.

- OR -

2 (b) The graphic shows a mechanism to control a working model of a street bollard.



Street bollards



- (i) Name the parts of the mechanism labelled **X** and **Y**.
State **one** advantage to using this type of mechanism to control the bollard.
X: Rack [3 marks], Y: Work (gear) [3 marks], Advantage [3 marks]
(large torque, prevent slip, locks in place, heavy load, speed reduction, etc.) (9 marks)
- (ii) The mechanism shown rotates the direction of motion by 90°.
Name and sketch another mechanism which could achieve this change of direction.
Alt mechanism named : Bevel gears [3 marks], sketch of same [3 marks]
(6 marks)
- (iii) Explain why limit switches should be used as part of the control circuit for this mechanism. Name a suitable type of switch to act as a limit switch.
Limit switches will indicate when bollard has reached limits of movement and will stop motor running. [3 marks]
Lever switch , PTB microswitch, reed (with magnet) switch [3 marks]
(Limit switch : 0 mks) (6 marks)
- (iv) If the motor attached to gear Y rotates at 200 RPM, calculate the time for which the motor must run to raise the bollard by 1 meter.
t = 30 seconds [4marks] (See appendix).
(4 marks)

Section C - 50 Marks

Answer **one** question from this section – all questions carry equal marks.

This section relates to **Technology & Society**, **Control Systems** and **Design & Manufacture**.

3. Technology & Society



- (a) 'To lead the transition to a low carbon future,
we need creative and innovative problem solvers.'
#GenerationTomorrow

- (i) Outline **two** reasons why we must transition to a low carbon future.
Reasons [2 x 5 marks] - global warming, pollution, limited resource, etc.
- (ii) Outline **two** technologies which will assist this transition.
*Technologies [2 x 5 marks] - hybrid or electric cars,
environmentally friendly alternatives for energy generation, etc.
(Technology named and brief outline of that technology)*

(20 marks)

- (b) Technology impacts the environment, people and society as a whole.

- (i) Outline, using suitable examples, **two** positive impacts of technologies on elderly people in society.
2 examples outlined [2 x 5 marks] - medical, mobility, communication, etc.
- (ii) Outline, using suitable examples, **two** negative impacts of the use of plastics technologies on the environment.
*2 examples outlined [2 x 5 marks] - waste accumulating in environment,
harming sea life, not recyclable (wasted resource), pollutant, etc.*
- (iii) Outline, using suitable examples, **two** ways in which changes in communications technology have changed society.
*Ease of communication (at lower cost) across the planet,
'instant' update on breaking news items, ordering online,
Social media apps, etc.
2 examples outlined [2 x 5 marks]*

(30 marks)

5:3:1 Paragraph, Sentence, Word

4. Control Systems and Technology & Society



- (a) Commercial drones use a range of technologies to operate correctly. These include **GPS**, **remote control** and **live video feed**. Explain, the function of any **two** of these technologies in operating a drone.

Function of any 2 technologies explained - [2 x 5 marks]

GPS: Drone can determine its location with reference to satellites, homing tech.,

Remote control: Drone movement is determined by a drone operator using a wireless device to change speed, altitude and direction of travel.

Live video feed: Cameras attached to the drone send a real time video signal back to the drone operator to provide a 'drone perspective' view of the environment.

(10 marks)

- (b) Modern fire alarms, security and heating services in schools are all examples of advanced control systems.

- (i) Outline the role of **sensors**, **feed back** and **control panels** in any **one** of these systems.

*Role of sensor, feed back and control panel in **any one** of the services listed [3 x 4 marks]*

Sensor: detect changes in temperature/door opening/ smoke,

Feed back: send monitoring signals to controlling circuit to allow comparisons to be made and actions taken

Control panel: Allows parts / all of the service to be monitored / turned off / on, allow operator to make changes to the system (temp. increase in colder weather etc.) records incidents on the system, etc.

- (ii) Outline **two** advantages in using a control system for these services.

2 x advantages [2 x 4 marks]

Control system is automatic / runs 24 - 7 without intervention,

Automatically calls Fire Brigade, close fire doors, etc. if problem detected.

(20 marks)

- (c) Modern factory production lines are now commonly operated by robotic machines, having replaced many people in the workforce.

- (i) Outline **two** advantages in using robotic machines on production lines in place of people.

2 x advantages [2 x 5 marks]

Operate 24 - 7 without a break, do not get 'tired', accurate, operate in dangerous situations, do not require salary, etc.

- (ii) Outline **two** new skills required of the human workforce such factories.

2 x new skills identified [2 x 5 marks]

Programming robotic devices, mechanical and electronic maintenance of robotic devices, etc.

(20 marks)

5. Design & Manufacture



'Iasc' are an import and distribution company, for fishing equipment, to shops around the country. The company requires an animated display based on the name and the company logo shown.

- (i) Describe, with the aid of sketches, the steps required to **manufacture** a suitable display from a named material.

Name any tools required and state the processes used to manufacture the logo.

Manufacturing the display - 4 steps [4 x 5 marks] Tools/Materials & Process

- drawing of parts/marking out, material processing (tools / processes named), display construction (joining techniques).

(20 marks)

- (ii) Describe the steps you would take to ensure that the final display is **safe** for use and finished to a **high standard**.

3 steps identified to ensure display is safe and well finished. [3 x 5 marks]

Display stable, well constructed, safe finish (edges) / parts

(15 marks)

- (iii) Describe, with the aid of sketches, how the display could be **animated**.
Name any additional components required.

Animating the display: [3 x 5 marks]

Sketches of proposed animation,

All parts labelled (components / system identified)

Viability of proposed animation.

(15 marks)

6. Control Systems

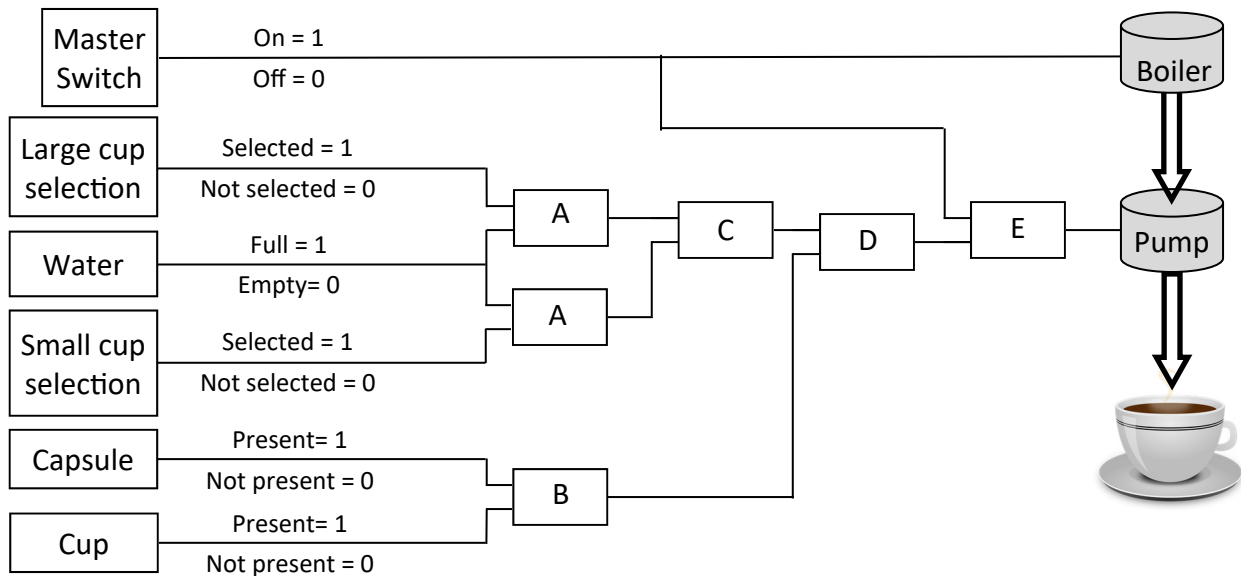
- (a) A system diagram, to control the operation of a home coffee machine is shown. Coffee will be delivered if the machine is switched on, a cup, water and a coffee capsule are present.



The system has the following features:

A master on/off switch and two coffee selection buttons (large or small coffee).

A low water level, coffee capsule and cup detection sensors.



- (i) Name the logic gates required at **A**, **B**, **C**, **D** and **E**.

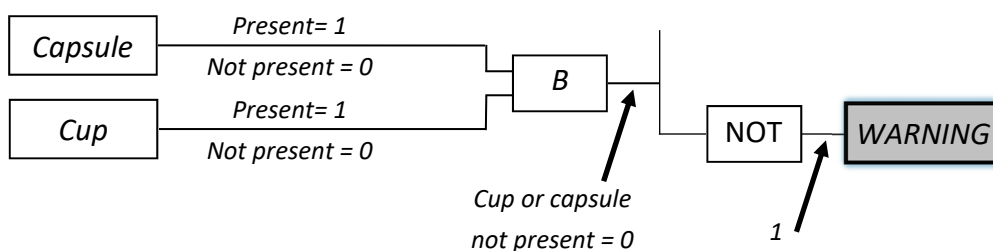
A: AND gate, B: AND gate, C: OR gate, D: AND gate, E: AND gate
[5 x 2 marks]

- (ii) Sketch a truth table for gate **E**.
[4 x 2 marks for each correct line in table]
+ 2 marks if table fully correct

Input	Input	Output
1	1	1
0	1	0
1	0	0
0	0	0

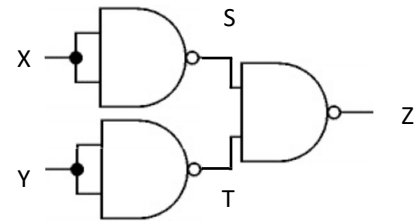
(If incorrect gate identified in (i) - OR gate, allow full mks for correct OR gate table)

- (ii) Design a modification to the system to display a warning message if a coffee cup or if coffee capsule is not present.
Modification : Input to gate identified, Process (gate), output. [2 mks, 4 mks, 2 mks]
Modification explained / evident [2 marks] (See appendix).



(30 marks)

- (b) A NAND gate is a combination of an AND gate followed by a NOT gate. NAND gates can be combined to construct other gates. Use a truth table to determine which gate is represented by the NAND gate combination shown.

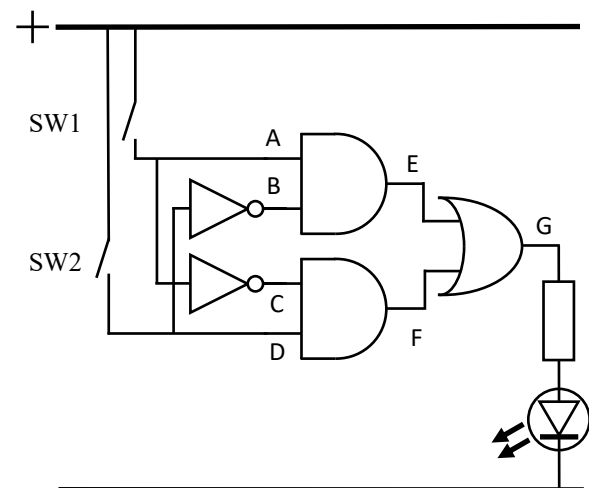


[4 x 2 marks for each correct line in table]
+ 2 marks if gate correctly identified as **OR**

INPUT X	INPUT Y	S	T	OUTPUT Z
1	1	0	0	1
1	0	0	1	1
0	1	1	0	1
0	0	1	1	0

(10 marks)

- (c) Use a truth table to determine the conditions for switches SW1 and SW2 (on or off) in order to light the LED in the circuit shown.



LED is on if SW1 **or** SW2 are on
but **not both** [10 marks]

[4 x 2 marks for each correct line in table]
+ 2 marks if table fully correct

(10 marks)

SW1	SW2	A	B	C	D	E	F	G	LED
On	On	1	0	0	1	0	0	0	Off
On	Off	1	1	0	0	1	0	1	On
Off	On	0	0	1	1	0	1	1	On
Off	Off	0	1	1	0	0	0	0	Off

Appendix

2.b(iv) If the motor attached to gear Y rotates at 200 RPM, calculate the time for which the motor must run to raise the bollard by 1 meter.

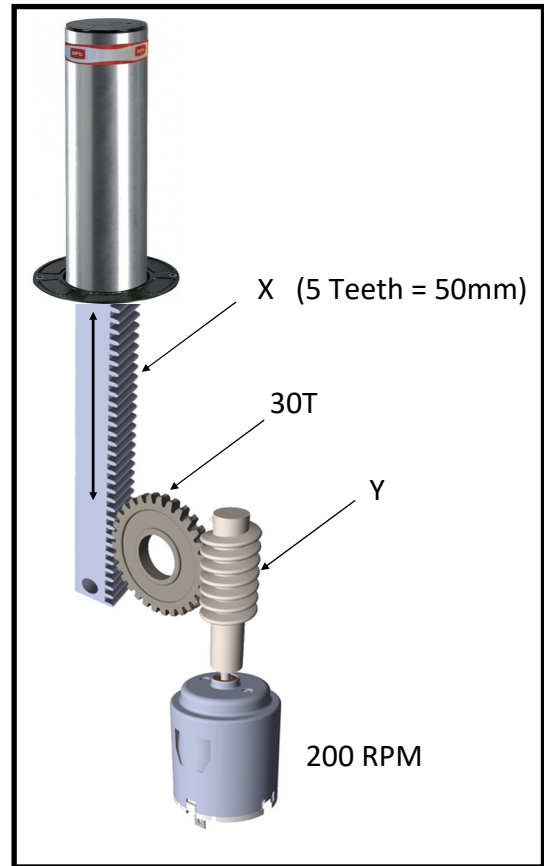
Rack: 5 Teeth = 50mm
=> 1 Tooth = 10mm

To raise bollard by 1m (1000mm) requires the bollard to rise by $1000/10 = 100$ teeth [1 mk]

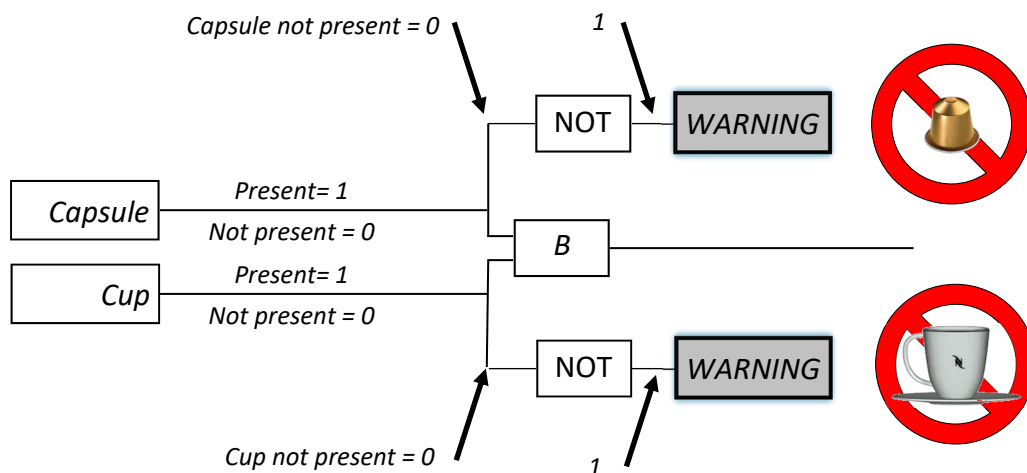
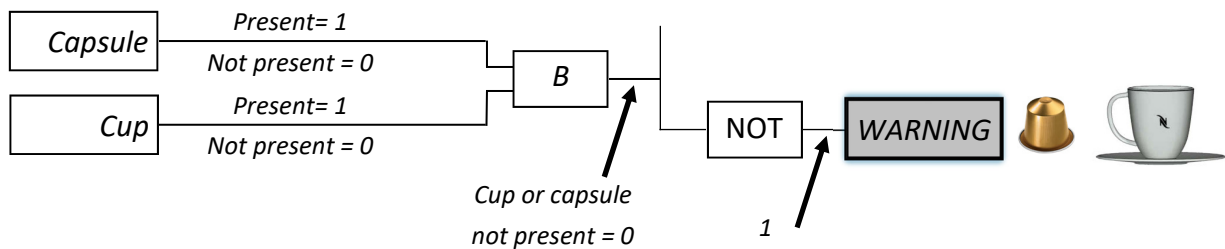
1 rotation of the worm will raise the bollard by 1 tooth
100 rotations of the worm will raise the bollard by 100 teeth [2mks]

Motor turns 200 times in 1 minute (60 sec)
Motor will turn 100 times in 0.5 minute (30 sec) [100x(1/200) min] [1mk]

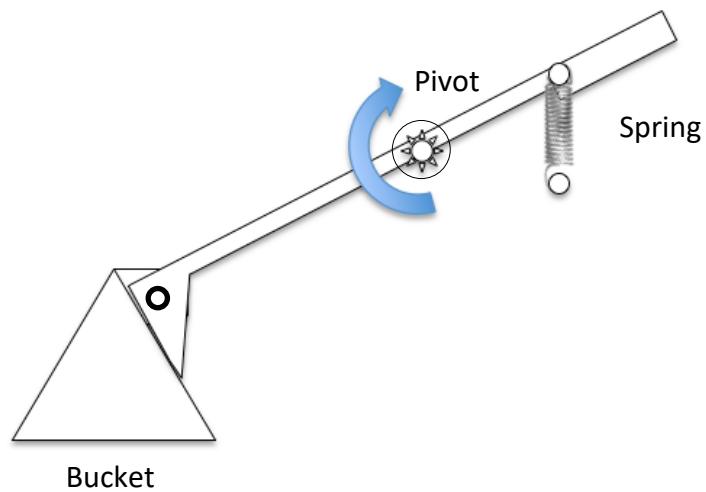
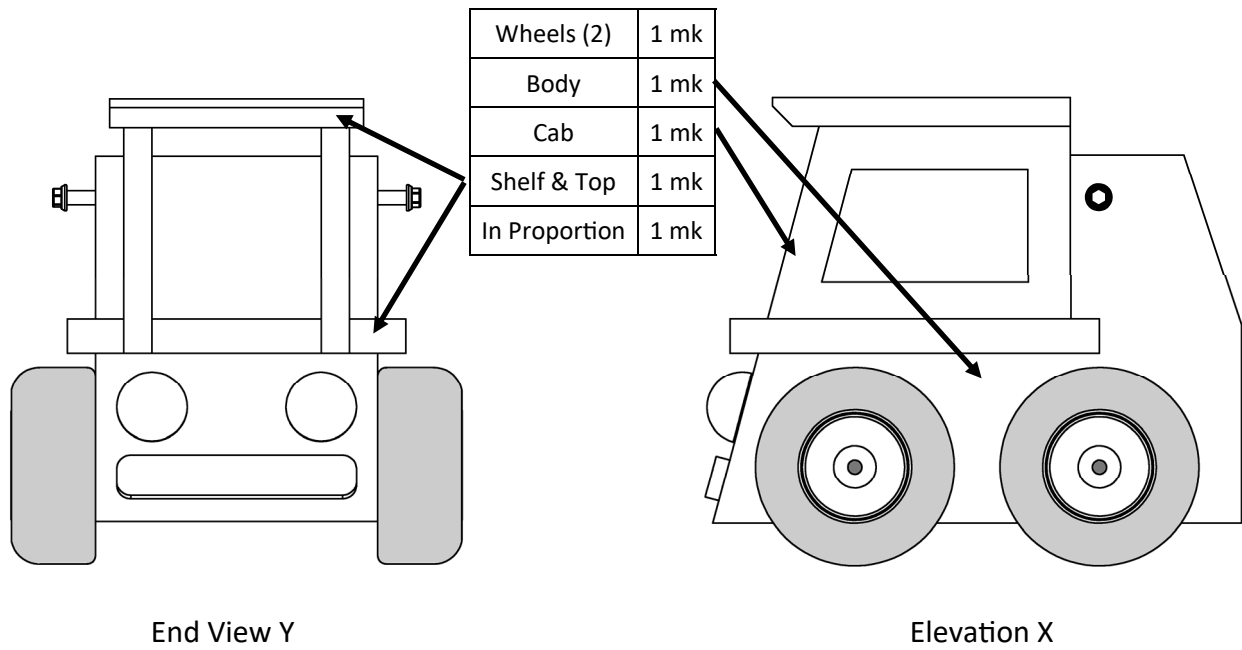
t = 30 seconds [4marks]



Q6(a) (iii)



Appendix: Sec B. Q. 1(a)



Appendix: Sec B. Q. 1(b)

