



Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE 2010

MARKING SCHEME

TECHNOLOGY

HIGHER LEVEL



Junior Certificate Examination, 2010

Technology

Higher Level

Marking Scheme

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

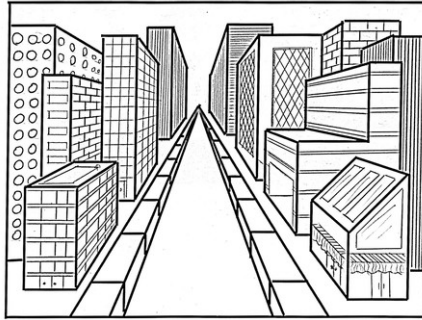
Examination Number

For Examiner	
Question	Mark
Section A	
Section B Q1 (a)	
(b)	
Q2 (a)	
(b)	
Section C Q3	
Q4	
Q5	
Q6	
Total	
Grade	

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

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

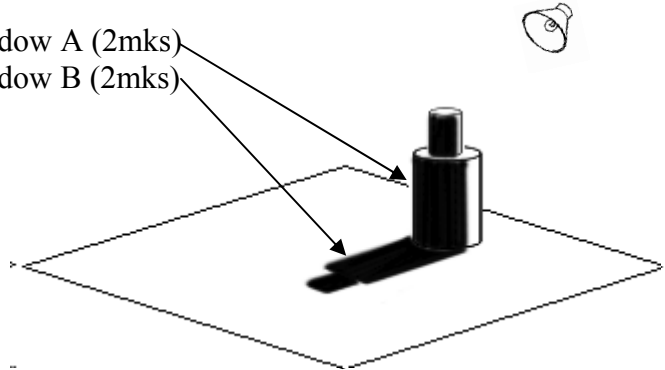
1. Name the type of sketch shown.



Sketch: Perspective (4 mks)
Pictorial (2 mks)
V.P. (1 mk)

2. Apply shading to the sketch shown, to suggest a light source in the position shown.

Shadow A (2mks)
Shadow B (2mks)



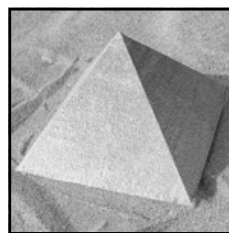
3. State the meaning of each of the symbols shown.



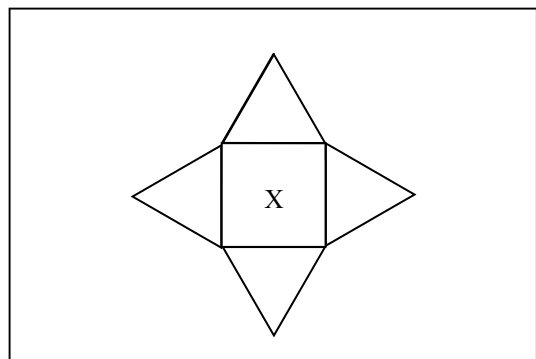
(i): Fire (Hazard)
(2 mks)

(ii): Assembly area
(2 mks)

4. Sketch a development of the square-based pyramid shown.



4 faces x 1 mks
X = 1 mk (4 mks)



5. State the meaning of each of the abbreviations:

(i) ROM,

(ii) USB.

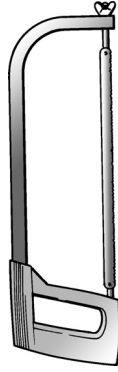


(i) ROM: Read Only Memory (2 mks)

(ii) USB: Universal Serial Bus (2 mks)

6. Name the type of saw shown
and

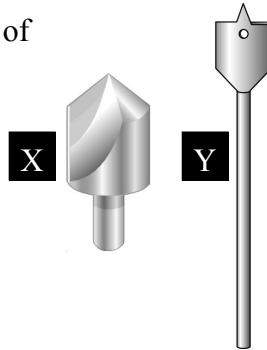
state why this saw is not suitable for cutting wood.



Saw : Hack Saw (2 mks)

Reason : Wood blocks teeth (2 mks)

7. State the purpose of each of the tools X and Y shown.

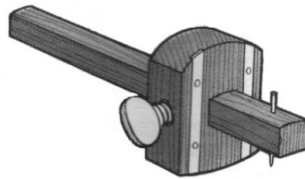


X : To countersink a screw (2mks)

Y : To drill a large hole in wood /acrylic (2mks)

8. Name the tool shown
and

explain the function of this tool.



Tool : Marking (mortice) guage (2mks)

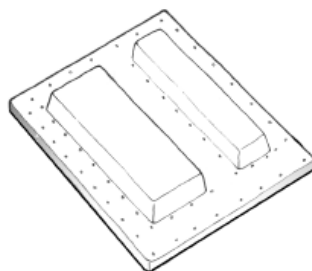
Function : To mark out wood (2 mks)
Parallel lines / markout joint /
Mark out mortice and tenon

9. State **two** safety precaution which should be observed when using the pillar drill shown.



(i) & (ii):
Any **two** valid safety precautions -
Goggles, hair, loose cloths, clamp work piece, etc. (2 x 2 mks)

10. Why is it necessary to drill holes in the mould shown, which is used in vacuum-forming ?



ONE Reason : Allow for easy release of shaped (vacuumed) plastic (4 mks)
Allow air to be drawn down,
Allow better definition on work piece, etc.

11. Name the units of

(i): Capacitance,

(ii): Power.



(i) Capacitance: Farad (2 mks)

(ii) Power: Watt (2 mks)

12. What property of a thermistor changes with a rise or fall in temperature?



Thermistor

Property: Resistance (4 mks)

13. State **two** reasons why LED bulbs are recommended replacements for incandescent bulbs.



LED Bulb



Incandescent Bulb

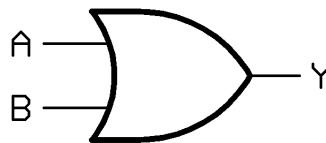
(i) & (ii): Any two valid reasons (2 x 2 mks)

Last longer, more energy efficient, Energy loss to heat minimized, Environmental, quality of light, etc.

14. Name the logic gate represented by the symbol shown

and

complete the truth table for that gate.



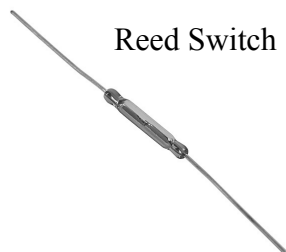
Gate: OR gate (2 mks)

Truth Table

A	B	Y
1	1	1
0	1	1

2 outputs x 1 mks (2 mks)

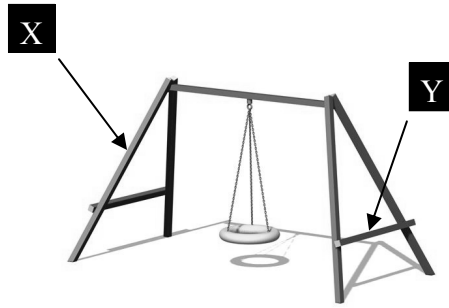
15. Name the component required to activate the reed switch shown.



Reed Switch

Component: Magnet (4 mks)

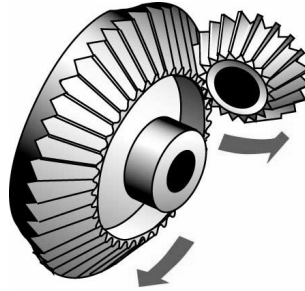
16. Name the forces acting at X and at Y on the swing shown.



X: Compression (2 mks)

Y: Tension (2 mks)

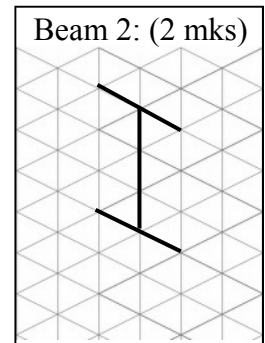
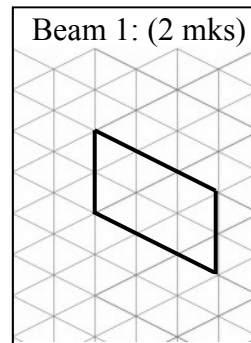
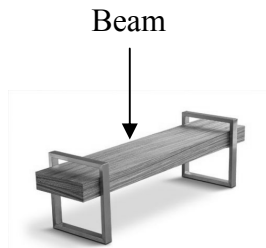
17. Name the gear system shown.



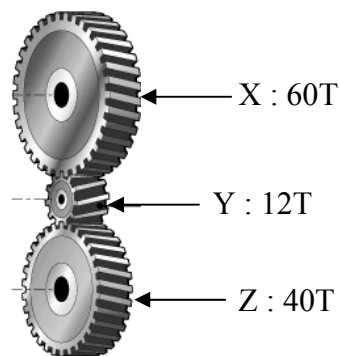
Gear system: Bevel gears (4 mks)

18. The solid beam shown can be replaced by a lower cost beam containing less material.

Sketch a cross section of **two** suitable replacement beams.



19. Calculate the speed of gear Z if gear X is rotating at 120 RPM.



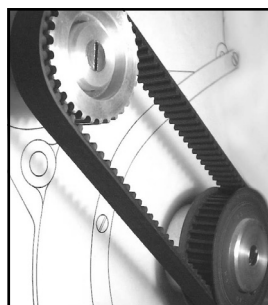
$$60T \times 120 \text{ RPM} = 7200 \text{ (1mk)}$$

$$7200 = 12T \times 600 \text{ RPM (1 mk)}$$

$$600 \text{ RPM} = 40T \times 180 \text{ RPM (2 mks)}$$

Speed Z: 180 (RPM) (4 mks)

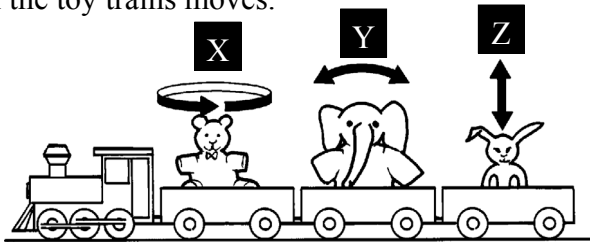
20. State **two** reasons why a pulley and toothed belt is used instead of a gear and chain on an inkjet printer.



(i) & (ii): Any **two** valid reasons (2 x 2 mks)

Quiet, no lubrication required, cost less, easier to change, etc.
Slip = 0

21. Name and sketch a suitable mechanism which will produce **any one** of the movements shown when the toy train moves.

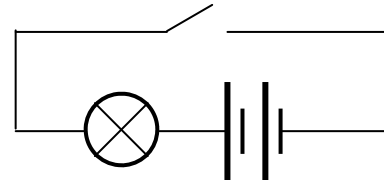
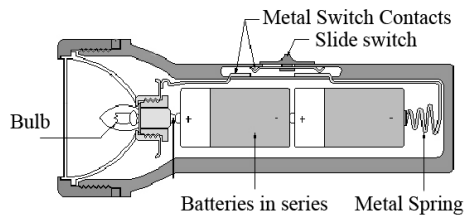


Selected movement :

ONE Mechanism name : (2 mks)
X (Bevel gear), Y (Cam & Lever), Z (Cam) or correct mechanism.

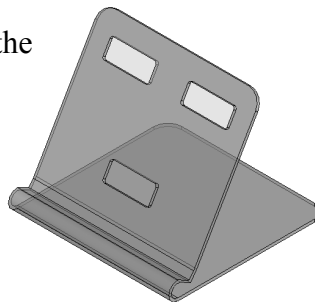
ONE Sketch : (2 mks)
X (2 mks), Y (2 mks), Z (2 mks)

22. Using appropriate symbols sketch the electric circuit shown in the torch.



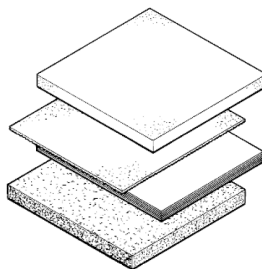
Circuit: Bulb (1 mk), Switch (1 mk), Cells(1 mk), Conectors (1 mk)

23. Name the piece of equipment required to bend acrylic into the shape shown.



Equipment: Strip heater (4 mks)

24. State **two** reasons why man-made boards can be preferred to natural wood.



(i) & (ii) : Any **two** valid reasons
 (2 x 2 mks)

Uniform, no defects (knots), cost, sizes, strength, named unique property etc.

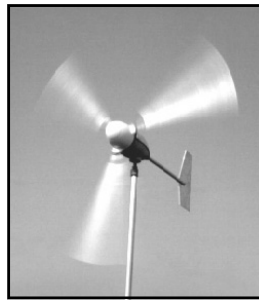
25. State **two** uses of integrated circuits (chips) in modern toys.



(i) & (ii): Any **two** valid reasons
 (2 x 2 mks)

Sound/Music (voice) chip,
 Movement (detection) control,
 Light sequence control, etc.

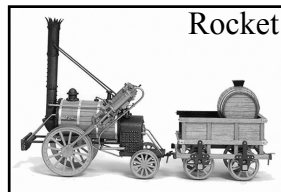
26. Name **two** sources of renewable energy other than solar and wind power.



(i) & (ii): Any **two** valid sources
(2 x 2 mks)

Wave, water(hydro), biomass,
Geothermal, etc.

27. Name the inventors associated with the following inventions.



Rocket

Invention: Rocket

Inventor: Stephenson (2 mks)



Flyer

Invention: Flyer

Inventor: Wright Bros. (2 mks)

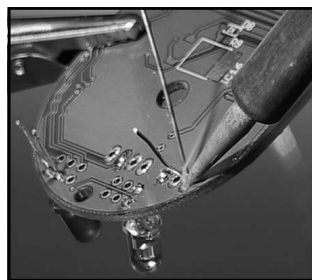
28. Name **two** new technologies found in modern mobile phones.



(i) & (ii): Any two valid technologies
(2 x 2 mks)

GPS, WWW, Cameras, Touch screen,
videoconference, Apps, etc.

29. Solder is an alloy.
Explain the term **alloy**.



Alloy : (4 mks)

Two or more metals mixed together.
Or named elements Pb & Sn.

30. Name **two** properties of man-made fabrics.

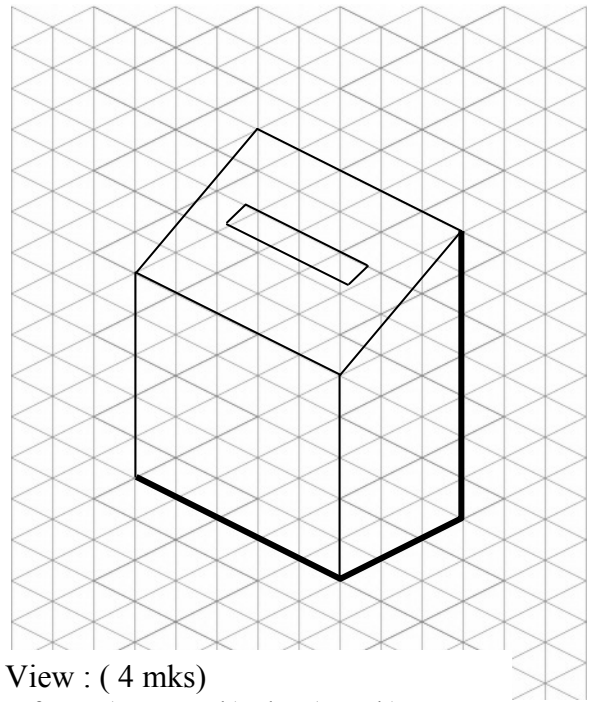
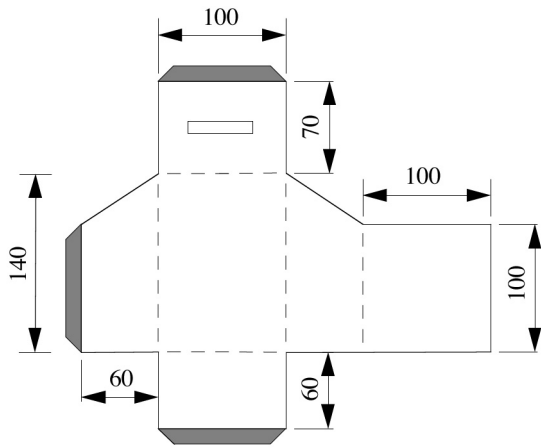


Property 1 & 2:

Any **two** valid properties (2 x 2 mks)

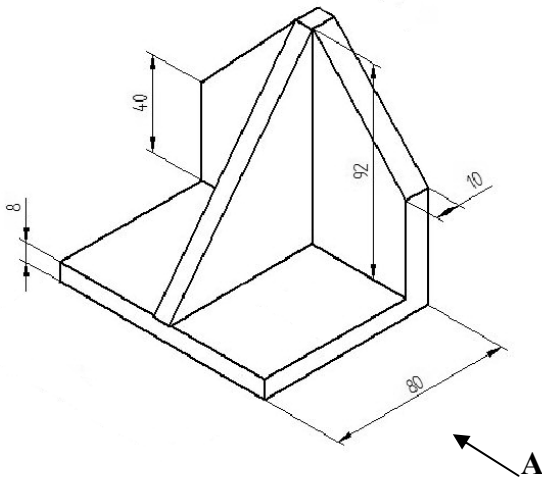
Colour fast, breathable,
crease free, non iron, drip dry, etc.

31. Complete the isometric view of the box whose development is shown below.

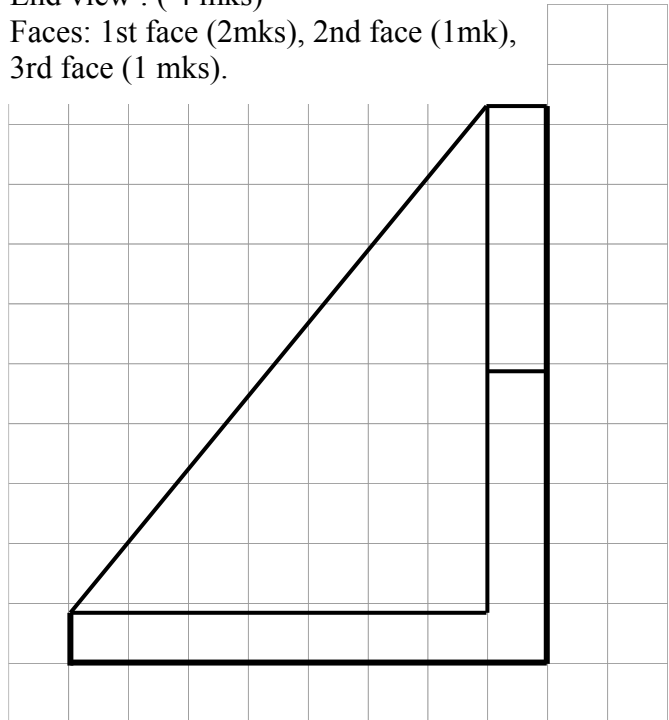


View : (4 mks)
3 faces (3 x 1 mk) slot (1 mk)

32. Complete the end view of the object shown, when viewed from the direction of arrow A.



End view : (4 mks)
Faces: 1st face (2mks), 2nd face (1mk),
3rd face (1 mks).





Junior Certificate Examination, 2010

Technology

Higher Level

Marking Scheme

Section B and Section C

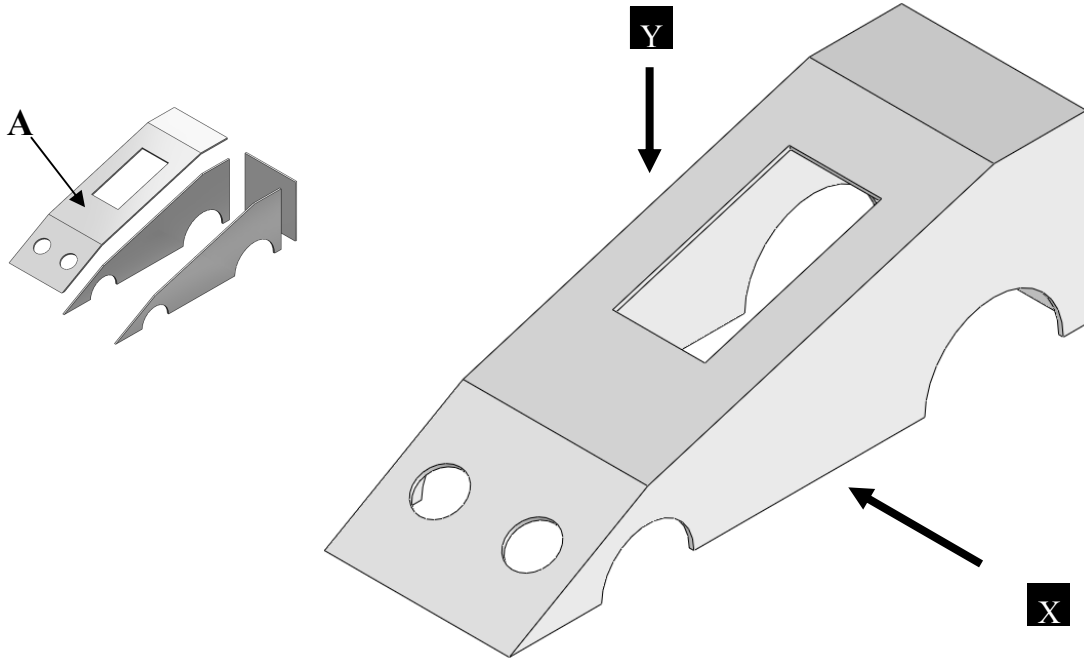
Section B - 50 marks

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 graphics show a design for a model car body.
The top section **A** is to be made from **one piece** of red acrylic.
The sides and back are separate pieces of acrylic.



- (i) (i) Make well proportioned sketches of the following views of the assembled body:

1. An elevation when looking in the direction of arrow 'X'.
Correct elevation: 2 mks, Wheel arch 1: 1 mk, Wheel arch 2: 1 mk, 3 angles: 1 mk.
2. A plan view when looking in the direction of arrow 'Y'.
Correct plan view: 2 mks, 3 panels (with cuts-outs): 3 x 1 mks.

10 marks

- (ii) 1. Describe, using suitable sketches, the steps required to make the top section in acrylic.
*3 Steps (sketched) to cut and finish panels: 3mks,
Marking out, cut, drill, file, bend, etc.,
Steps (sketched) to cut out central opening: 2 mks*
2. This body is to be attached to a chassis (base).
Describe using suitable sketches a method to attach the body to the chassis.
Steps (sketched) to attach body to chassis: 5 mks.

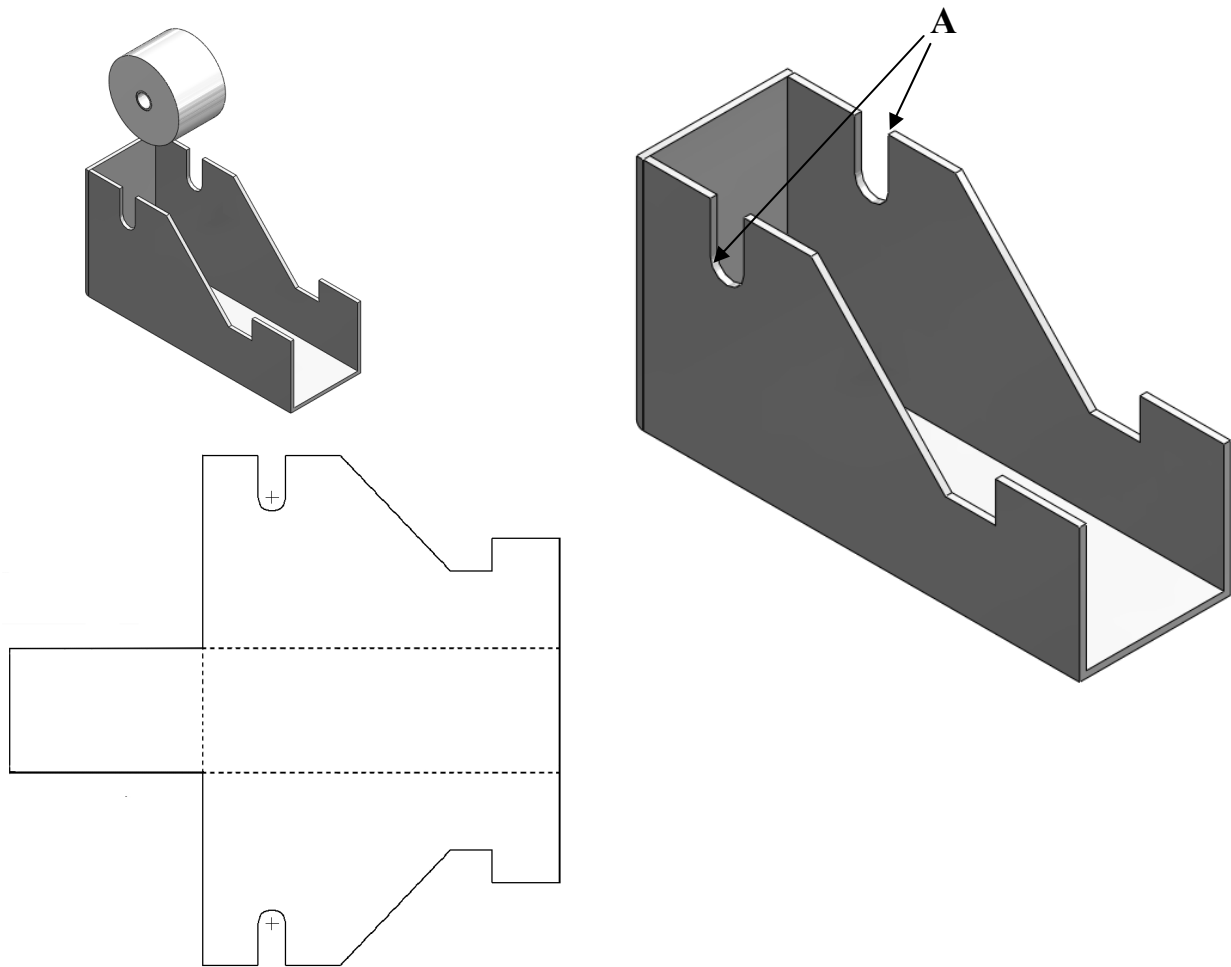
10 marks

- (iii) Suggest using suitable sketches 2 safety improvements which could be made to the model car.
2 safety improvements sketched: 3 mks & 2 mks

5 marks

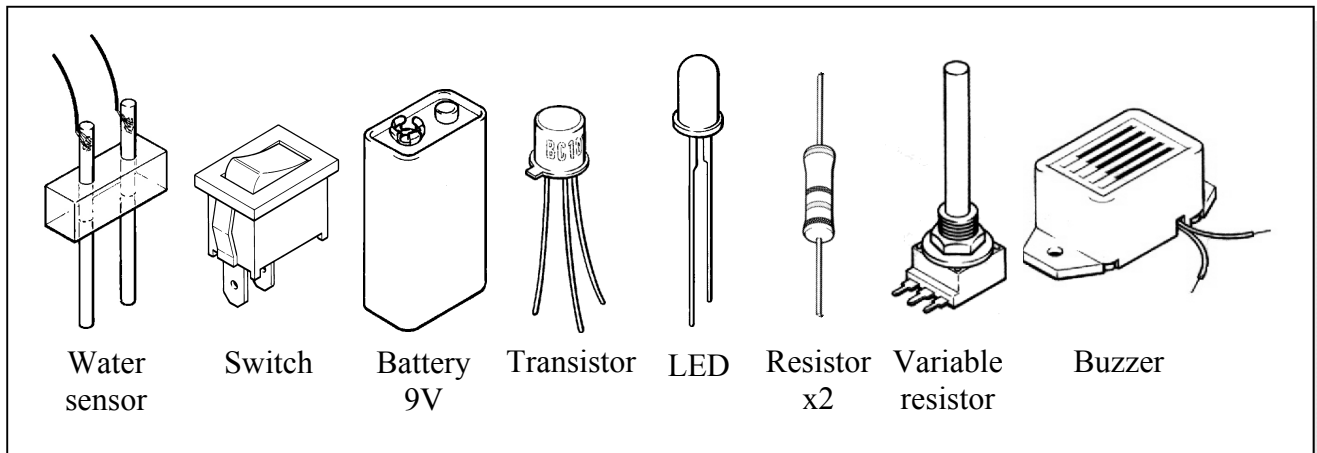
- OR -

- 1 (b) The graphics show a student design for a tape dispenser.
The dispenser is made from one piece of acrylic.



- (i) Make a well proportioned sketch of the **development** of the tape dispenser. Indicate clearly on your sketch the position of all bend lines. 10 marks
- Development: 4 correct panels (4 x 1 mks),
Panels in proportion (3 x 1 mks), Bend lines (dotted) (3 x 1 mks)*
- (ii) 1. Explain, using sketches, how the slots (A) on the side of the dispenser could be cut out.
2 steps (sketched) to cut out slots: 3 mks, & 2 mks.
2. The dispenser requires an attachment to cut the tape.
Describe, using sketches, how this could be achieved.
Sketched attachment: Valid design 3 mks, & sketch quality 2 mks. 10 marks
- (iii) Suggest a suitable method to hold a roll of tape securely in the dispenser.
Use sketches to support your answer.
- Suitable method to hold tape in dispenser: 5 mks (5, 3, 1)* 5 marks

- 2.(a) The following components are available to manufacture a water sensor as part of a flood warning system.



Colour	Black	Brown	Red	Orange	Yellow	Green	Blue	Violet	Grey	White
Value	0	1	2	3	4	5	6	7	8	9

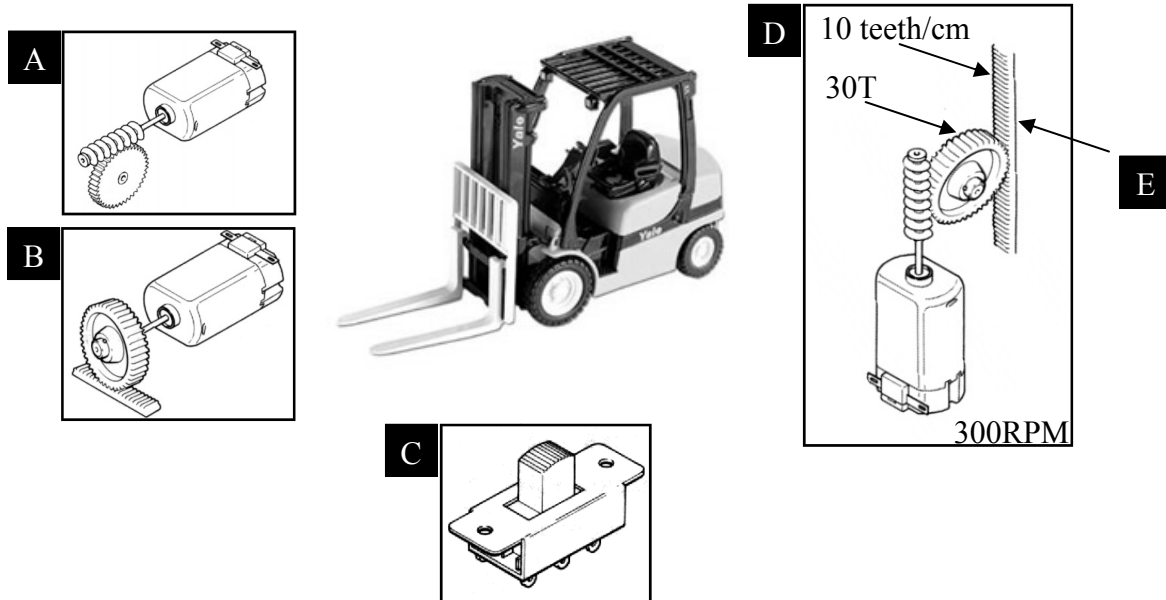
Resistor Colour Table

- (i)
1. State **two** functions of a transistor in a circuit.
Amplify (2 mks) & switch (2 mks)
 2. Explain how the **base pin** of the transistor can be identified.
Leg furthest from tab (2 mks)
 3. Explain why there are three pins on the variable resistor shown.
Valid explanation: (2 mks)
 4. A 330Ω and a $2.2k\Omega$ resistor are required in this circuit.
Using the colour table shown, state the colour codes of these resistors.
330: Orange, orange, brown (3 mks (1 x 3))
2.2k: Red, red, red (3 mks (1 x 3))
 5. State **two** advantages of building this circuit using a printed circuit board (PCB) instead of using copper stripboard.
2 valid adv PCB: faster to build, less errors, no track cutting reqd., etc (2 x 2 mks)
- (ii) Using the components above, sketch a circuit diagram to include:
1. An on/off switch with LED power on indicator.
LED & series resistor (2 mks), Switch in series (1 mk)
 2. A sensor circuit which will activate the buzzer when rising water levels are detected.
Transistor & base resistor (2mks), Correct Potential divider (2 mks).

25 marks

- OR -

- 2.(b) A student is required to build a model forklift based on the image shown. The mechanisms at **A** and **B**, are available for use in the model.



- (i) 1. Name the mechanism attached to the motor at A. *A: Worm gear (2 mks)*
2. Name the mechanism attached to the motor at B. *B: Rack & Pinion (2 mks)*
3. State **two** advantages of mechanism A over mechanism B in lifting a load.
2 adv.: No slip, high torque, large speed reduction, compact, etc. (2 x 2 mks)
4. Name the switch shown at C, which is required to turn the motor in both clockwise and anticlockwise directions.
Switch name: DPDT (2 mks) 10 marks
- (ii) A combination of the two mechanisms at D, was decided upon for the lifting mechanism.
1. If the motor speed is 300RPM, calculate the distance moved by part E in 1.5 minutes.
Distance: 45 cm(6 mks)
[1.5min: worm 450 turns (2mks), '30T' adv. 450teeth (2mks), Rack adv. 450/10 cm (2mks)]
2. Explain why limit switches should be included in the design of the lifting mechanism.
Stop motor (hoist) at top and bottom of lift. (4 mks) 10 marks
- (iii) Sketch and name an alternative mechanism which could be used to lift the forks up and down.
Valid alternative mechanism sketched (3 mks), Named (2 mks)
(Pulley, screw thread, pneumatic, chain & sprocket, cam, etc) 5 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 and Society

Transportation is the largest single user of fossil fuels and a significant source of environmental pollution in developed countries.



Modern hybrid motor cars are designed to use alternative energies and to be eco-friendly.

- (a) (i) Describe **one** way in which modern hybrid motor cars have reduced their dependence on fossil fuels. (4 mks: *ref electric option, hydrogen, veg. oil*)
- (ii) Describe **two** ways in which modern motor cars can be eco-friendly. (2 x 4 mks: *ref reduced emissions, recycle parts, design feature, etc.*)
- (iii) Describe **two** ways in which modern technologies have improved public transport. (2 x 4 mks: *any valid—luas, ticketing, scheduling, safety, cctv, valid safety feature, mobile tracking, etc.*)
- 20 marks

Food production, processing and long term storage have all been changed by new technologies.

- (b) (i) Using **one** named example in **each** case, outline how new technologies have changed food production, processing and storage.
- 5 mks: food production—named technology (2mks) & change outlined (3 mks)*
- waste management, GM, hydroponics, etc.
(5 mks: food processing -named technology (2mks) & change outlined (3 mks)
- freeze dry, dehydration, radiation, UHT, etc.
(5 mks: food storage -named technology (2mks) & change outlined (3 mks)
- Vac. Pack, drying, etc.
- (ii) Explain briefly why a demand exists for ‘**organic**’ food products. (5 mks: *organic—‘chemical free’, better, no sprays, etc.*)
- 20 marks
- (c) In the case of **two** named domestic appliance, outline **one** safety feature present in the appliance. Explain the purpose and operation of the safety feature.
- (5 mks: Named appliance (2 mks), Safety feature –purpose & operation (3 mks))*
(5 mks: Named appliance (2 mks), Safety feature –purpose & operation (3 mks))

10 marks

4. Control Systems & Technology and Society

Modern commercial robotic machines can be classed as:
Domestic, Industrial, Research or Military.



- (a) In the case of **any two** robotic machines:
- (i) Outline the function and operation of **each** robotic machine.
(Machine 1: Function (2 mks), Operation (3 mks))
(Machine 2: Function (2 mks), Operation (3 mks))
 - (ii) Explain why **each** selected robot is a suitable replacement for a person.
(Why suitable replacement: (5 mks))
- dangerous environment, work repetitive, work heavy, etc.
- (b) Outline **two** ways in which the operation of a robot might be controlled or altered.
(Method 1 (to control) (5 mks))
(Method 2 (to control) (5 mks))
- by: wire, radio, satellite, - joystick /programme control.
- (c) Explain why external sensors are required by robots and outline the importance of 'feedback' in controlling the operation of a robot.
(Requirement for external sensors: (5 mks))
(Importance of 'feedback': (5 mks))
- (d) Explain, using suitable sketches, how robotic machines can move over uneven ground.
(Sketch: (5 mks))
- tracks, indep. wheels, multiple wheels, etc.
- (e) Outline **two** power sources which can be used to provide movement for robotic arms.
(Power source 1: (5 mks))
(Power source 2: (5 mks))
- electro-mechanical, pneumatic, hydraulic.

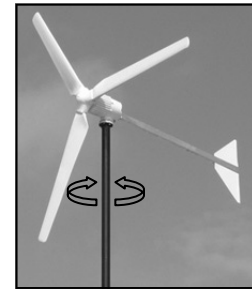
50 marks

5. Design and Manufacture

A student is required to manufacture a model of a wind speed and wind direction indicator based on the design shown.

The completed model will be placed outdoors and must turn freely about a supporting pole.

(Do not include the propeller in your answer)



Remote display



- (a) (i) Name a suitable material for the model and give **two** reasons for your choice.
(Suitable material (2 mks), reason 1 (1 mks), reason 2 (1 mks))
- (ii) Describe, with the aid of suitable sketches, the steps required to manufacture the model from the named material.
(Sketches (4 mks), 2 x steps, (2 x 2mks))
Name **three** processes required to manufacture the model.
(3 appropriate processes named (3 x 2mks))
- (iii) Describe, with the aid of suitable sketches, how the model will turn freely about a supporting pole.
(Sketches (4 mks), turn freely: description (2 mks))
- (iv) Describe, with the aid of suitable sketches, how the model and supporting pole will be supported to remain upright in strong winds.
(Sketches (4 mks), support: description, (2 mks))

30 marks

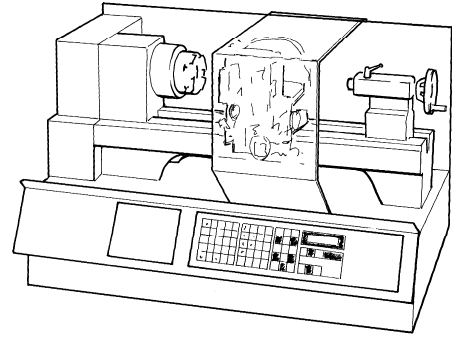
- (b) (i) Sketch a suitable 9V circuit diagram, to be included in the model, which will display the wind direction as lit LEDs on a remote display.
(Valid circuit (10 mks))
- 4 suitable inputs identified (4 x 1 mks),
- 4 suitable connections to LED outputs (4 x 1 mks)
- power supply (9v) correctly connected (2 mks)
- (ii) Identify any limitations in the circuit design sketched and suggest a possible improvement.
(Limitation identifies: no. of wind directions limited by inputs(5 mks)),
(Improvement identified: valid improvement (5 mks))

20 marks

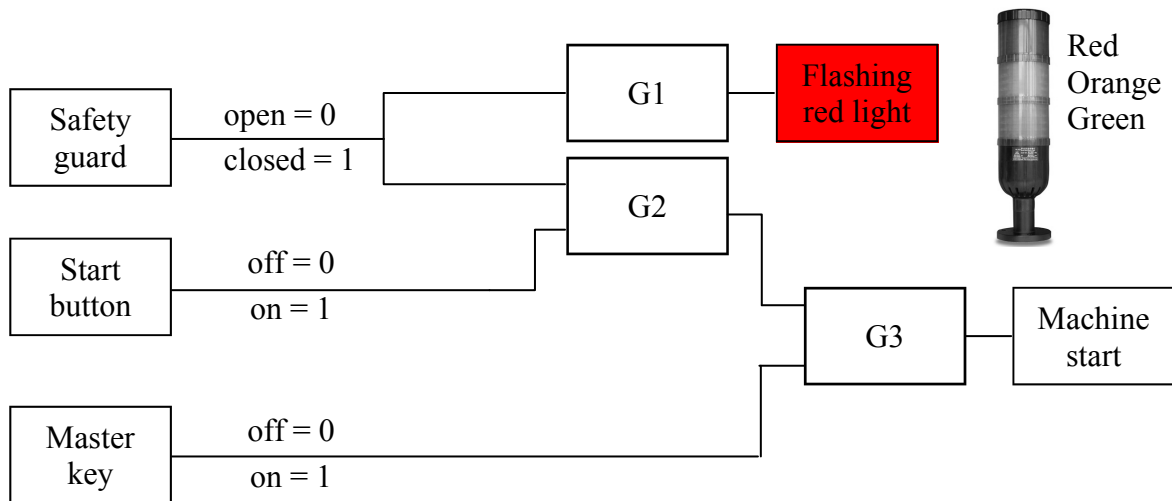
6. Control Systems

To improve the safety of the machine shown a control system, using logic gates, is required to prevent the operator starting the machine without the safety guard in place.

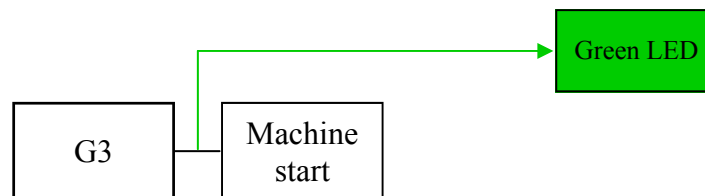
A master key must also be in place and turned on before the machine will start. A flashing light operates whenever the safety guard is open.



A block diagram of a possible system is shown.



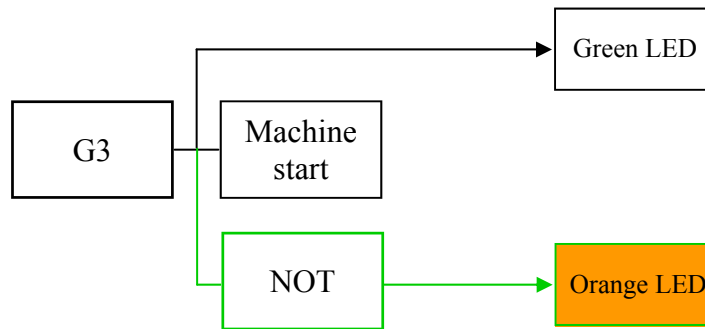
- (a) (i) Identify the logic gates required at G1, G2 and G3.
G1: NOT gate(3 mks), G2: AND gate (3 mks), G3: AND gate (3 mks).
- (ii) Sketch and complete a truth table for logic gates G1 and G3.
G1(NOT) truth table: 4 mks (2x2 mks: input and matched output)
G3(AND) truth table: 8 mks (4x2 mks: input and matched output)
- (iii) Indicate clearly how you would modify the system shown to display a green light, only when the machine is operating correctly i.e. the master key is turned on, the safety guard is in place and the start button is pushed.



Modification: Output from G3 to Green LED: (6 mks)

- (iv) Indicate clearly how you would further modify the system shown to display an orange flashing light if any one of the conditions in (iii) is not set correctly.

35 marks

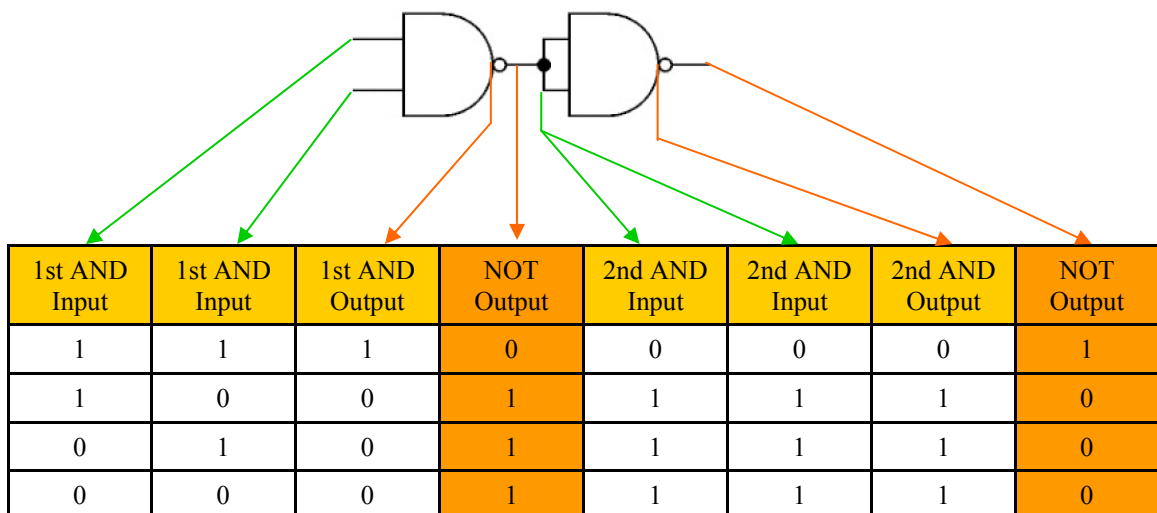


Modification: Output from G3 to NOT gate to Orange LED: (8 mks)

- (b) A NAND logic gate is a combination of two other logic gates.
NAND gates can be combined to form other logic gates.

- (i) Name the two gates required to produce a NAND gate.
NOT & AND (2 x 2 mks)
- (ii) Using a truth table identify the logic gate produced when two NAND gates are combined as shown.

2 x NAND = AND (3 mks)



Truth table (8 mks : 4 x 2 mks)

15 marks