



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2012

Marking Scheme

Technology

Higher Level



Junior Certificate Examination, 2012

Technology

Higher Level

Wednesday, 20th June
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

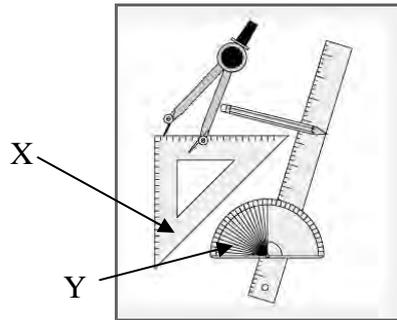
Examination Number

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 drawing equipment shown at X and at Y.

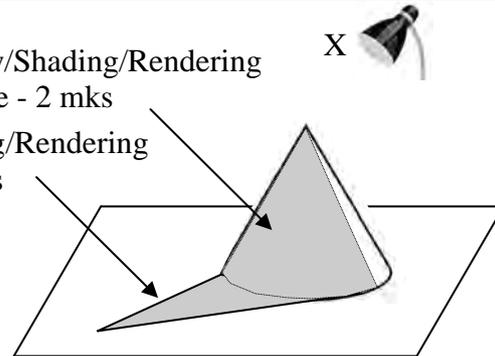


X: Setsquare - 2 mks

Y: Protractor - 2 mks

2. Use **two** rendering techniques on the sketch shown to suggest a light source at X.

Shadow/Shading/Rendering on Cone - 2 mks
Shadow/Shading/Rendering on Plane - 2 mks



3. Name **two** new technologies found in modern smart phones.



(i): Any two NEW technologies
2 x 2 mks

(ii): GPS, Cameras, Touchscreen, etc.

4. State **two** reasons why computers are used to control modern manufacturing.



CAM

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

(ii): Precision, reproducible, etc.

5. State the meaning of **each** of the safety signs shown.



(i)



(ii)

(i): 2 mks - Place cover on circular saw

(ii): 2 mks - Meeting/Assembly point

6. Name the type of material used in the handle shown

and

explain why this material is used for the handle.



Material:

2 mks - type of material insulator or
Named insulator: wood, plastic, etc.

Explain: 2 mks - prevent heat transfer to handle

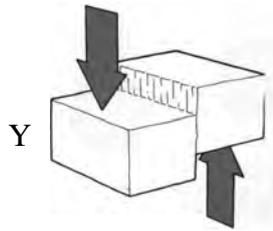
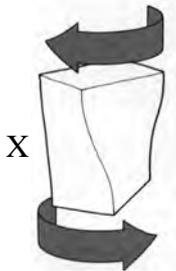
7. Name the **two** metals used to manufacture solder.



(i): 2 mks - Lead

(ii): 2 mks - Tin

8. Name the forces operating at X and at Y shown.



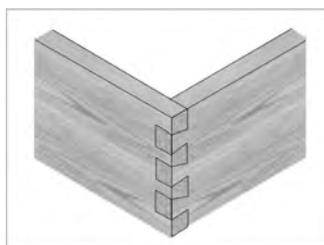
X: 2 mks - Torsion

Y: 2 mks - Shear

9. Name the type of wood joint shown

and

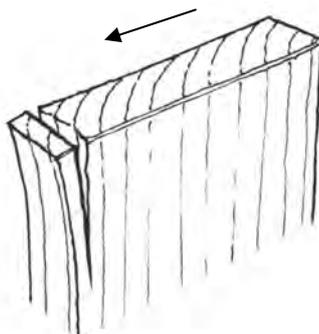
state **one** advantage to this type of joint.



Name: 2 mks - Dovetail joint

Advantage: 2 mks - strength,
difficult to pull apart, looks attractive

10. Explain briefly how to prevent the wood shown from splitting when planing the end grain.



Answer: 4 mks - clamp piece of waste wood to end of work piece.

11. Name the switch shown

and

name the component required to operate the switch.



Name: 2 mks - Reed switch

Component: 2 mks Magnet

12. In relation to the switch shown, explain the terms: NC and COM.



NC: 2 mks - Normally closed

COM: 2 mks - Common

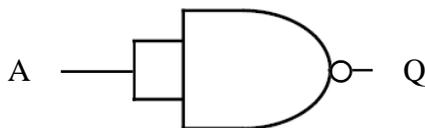
13. State **two** advantages to using a PCB to construct an electronic circuit.



(i): 2 x 2 mks
easier to construct circuit,
faster to construct circuit,
less errors in making circuit, etc.

(ii):

14. Complete the truth table for the NAND logic gate shown.



Truth Table

A	Q
1	0
0	1

2 mks

2 mks

15. Indicate clearly on the circuit shown, the correct location of:

(i) an ammeter

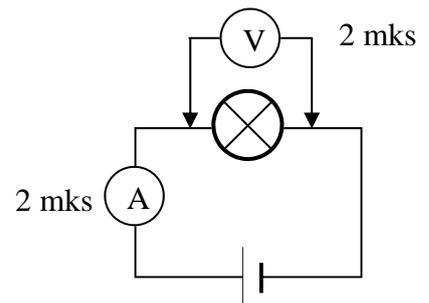


and

(ii) a voltmeter,



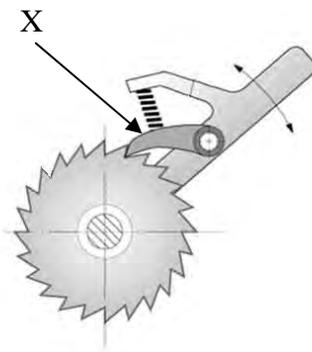
to measure the resistance of the bulb when lit.



16. Name the mechanism shown

and

state the function of part X.



Mechanism: 2 mks - Ratchet & Pawl

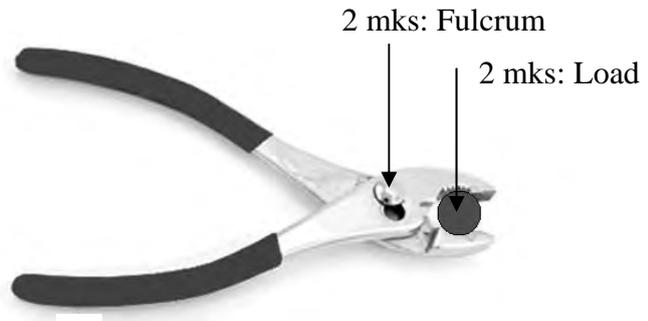
X: 2 mks - Prevent Ratchet turning clockwise / slip

17. Mark clearly on the sketch shown the location of:

(i) the Load

and

(ii) the Fulcrum.



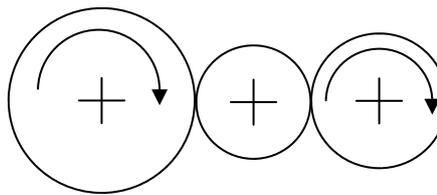
2 mks: Fulcrum

2 mks: Load

18. Calculate the speed and indicate clearly the turning direction of gear 'Z' in the gear train shown.

$[70T \times 300 = 35T \times 600]$

Driver
Speed 300RPM



X: 70T Y: 25T Z: 35T

Z: 2 mks - Speed
600 RPM

2 mks - Direction
Clockwise

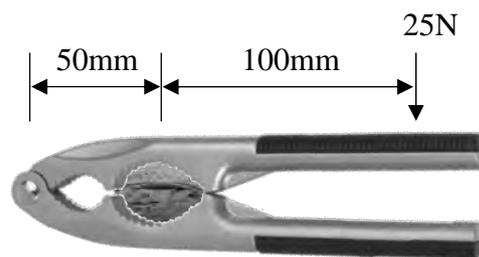
19. State **two** reasons why oil is used on the chain of a bicycle.



(i): Two reasons - 2 x 2mks

(ii): Lubricate, Prevent Rust, etc.

20. Calculate the Mechanical Advantage (MA) available in the nut cracker shown.



MA= 3 : 4 mks

$MA = \frac{\text{output force}}{\text{input force}}$

$= 75/25$

$(25 \times 150 = 50 \times 75)$

21. Name **one** synthetic and **one** natural material which could be used in manufacturing rain gear.



Synthetic: 2 mks - Gore Tex, PVC, Polyurethane, Rubber.

Natural: 2 mks - Leather, Canvas,

22. State **two** ways in which modern motor cars have been made more energy efficient.



(i): Any two valid ways - 2 x 2mks

(ii): Car design, Engine design, Hybrid cars, etc.

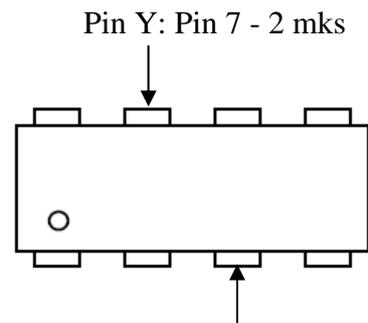
23. State **two** ways in which we can reduce our 'Carbon Footprint'.



(i): Any two valid ways - 2 x 2mks

(ii): Recycle, Compost, Lightbulbs, Share transport, turn off / unplug electrical devices, save water, buy local food, reuse, etc.

24. Indicate clearly the number of the pins, labelled X and Y, on the sketch of the chip shown,



25. State the purpose of the QR symbol shown.



Purpose: 4 mks - Contains information about product, Advertising, Using smartphones go to product website, Industry track product, etc.

26. Identify **two** safety precautions taken by the student, when drilling the workpiece shown.



(i): 2 x 2mks - Any two precautions

(ii): Facemask, Apron, no loose wires, workpiece clamped, etc.

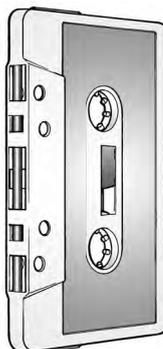
27. In relation to technology tasks, state **two** reasons why it is important to undertake an 'Investigation of possible solutions'



(i): 2 x 2mks - two valid reasons

(ii): Source design ideas, View existing solutions, Investigate suitable subsystems, etc.

28. State **two** reasons why cassette tapes were replaced by CDs and digital files, for sound recording.

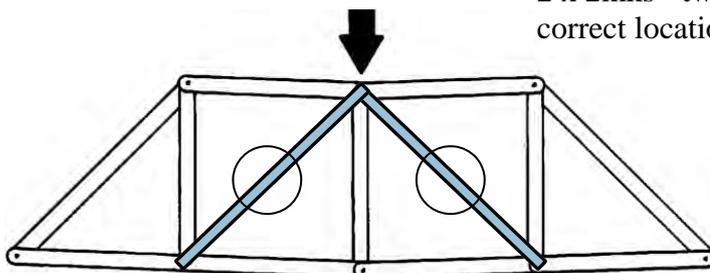


(i): 2 x 2mks - two valid reasons

(ii): Sound quality poor on cassette, Tape easily broken / damaged, Modern formats smaller, Difficult to access specific tracks, etc.

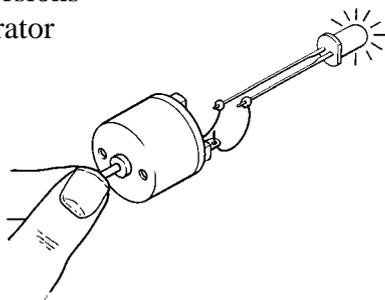
29. The sketch shows a bridge distorting under the force shown.

Sketch the location of **two** struts which will prevent the bridge from distorting.



2 x 2mks - two correct locations

30. Name **two** energy conversions taking place in the generator shown.



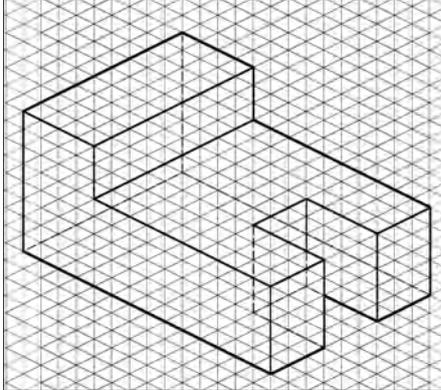
From: Kinetic/Mechanical (1 mk)

To: Light (1 mk)

From: Kinetic/Mechanical (1mk)

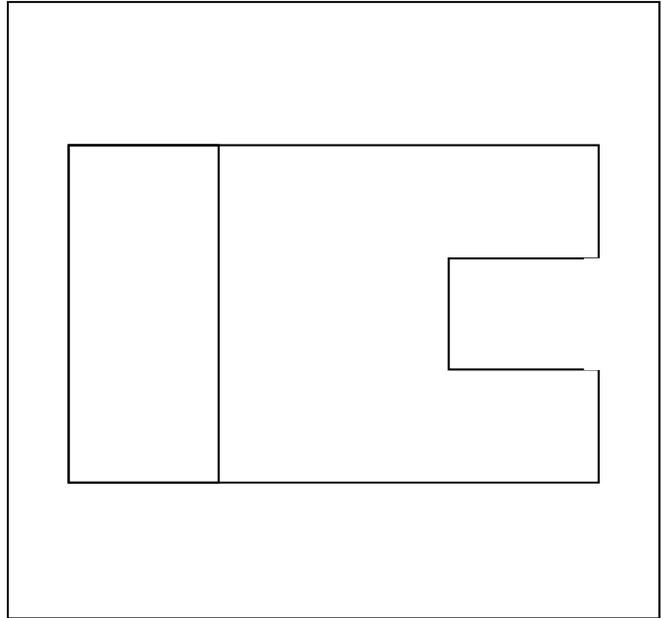
To: Electrical (1 mk)

31. Shown is an isometric view of a solid.
Sketch a Plan View of the solid in the space provided.



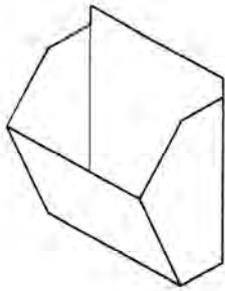
Isometric view

Correct Plan View: 2 mks
Proportions Correct: 2 mks



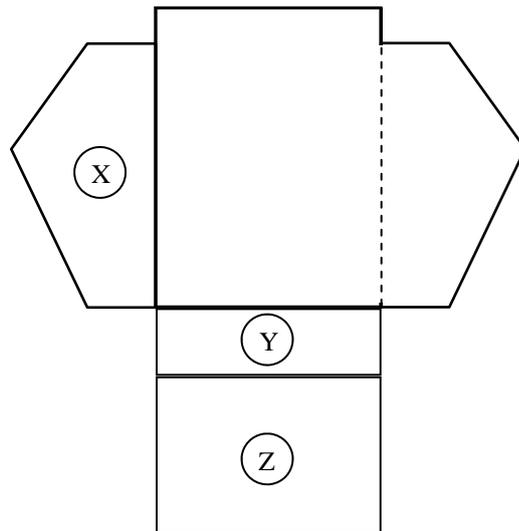
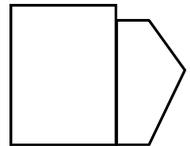
Plan View

32. Complete the development of the magazine holder shown.



Magazine Holder

Correct Development : 4 mks
(3 Panels: 2 mks, 1 mk & 1 mk.)





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Section B and Section C

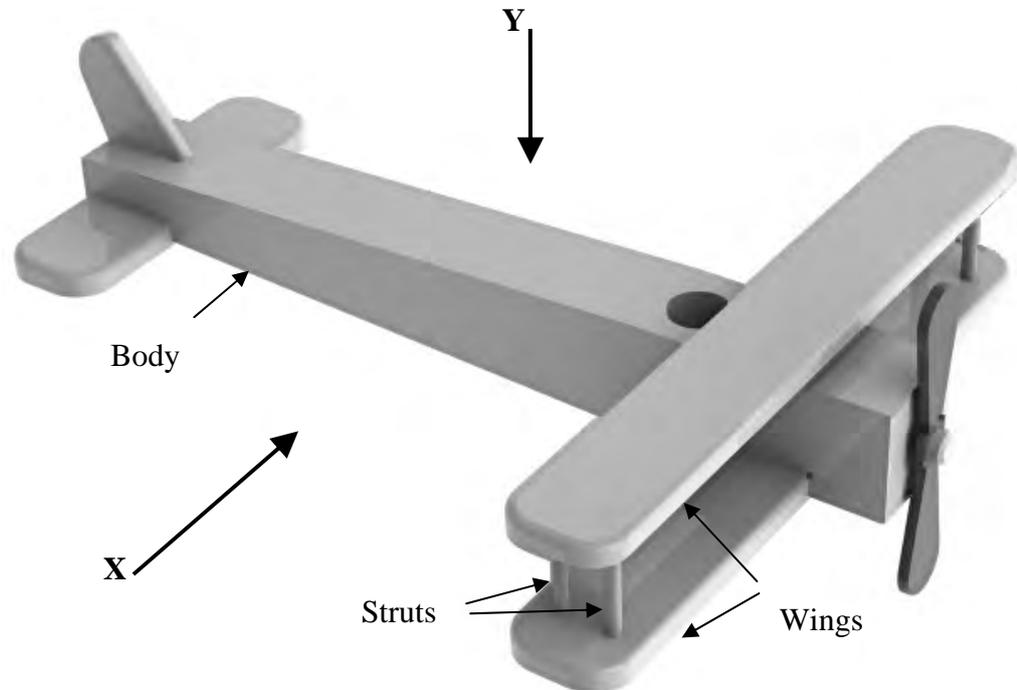
Section B - 50 marks

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 sketch shows a design for a toy plane. The body is made from 30 x 30 mm red deal. The wings are made from 6 mm acrylic strips, 30 mm wide.



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

1. An **elevation** in the direction of arrow **X**.
(Correct Elevation 5 mks)
2. A **plan** in the direction of arrow **Y**.
(Correct Plan 5 mks)

10 marks

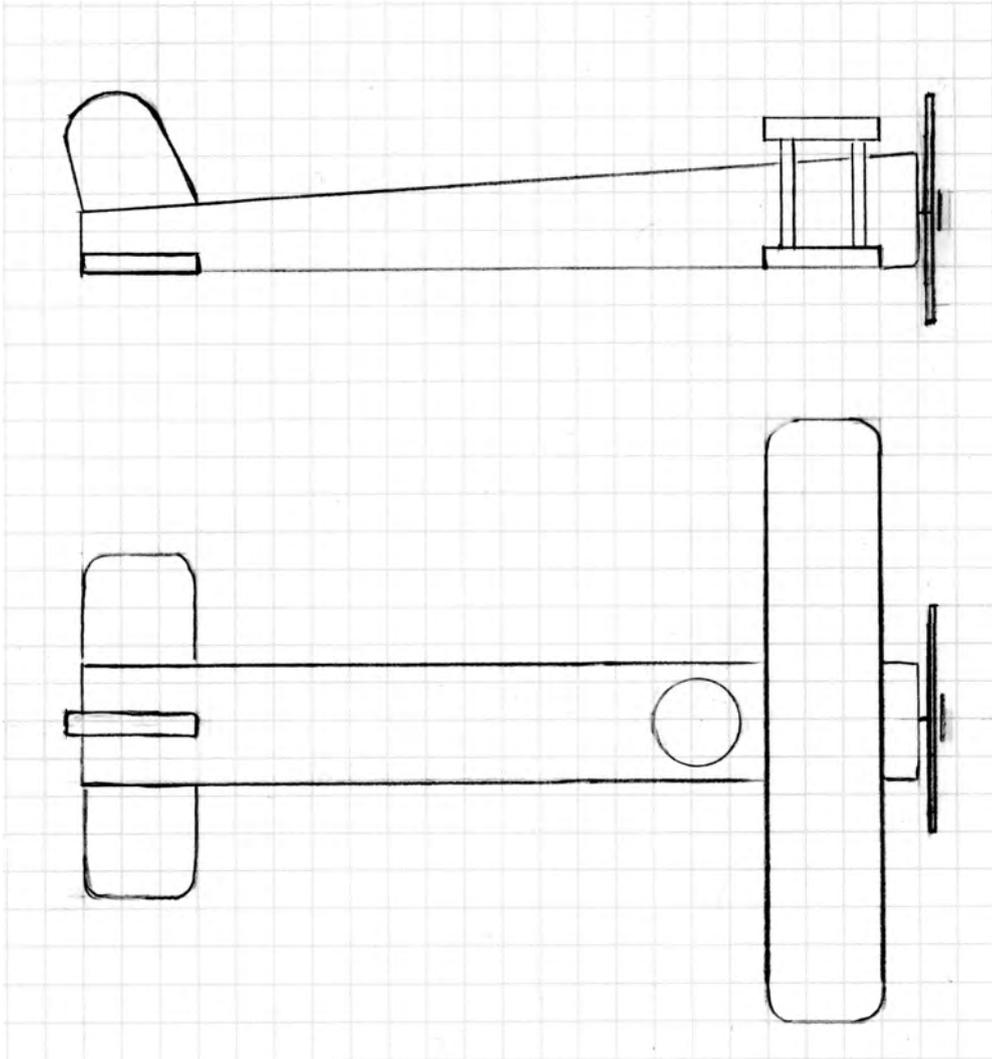
- (ii)
1. Describe, using suitable sketches, the steps required to make the body of the plane. (Any two valid steps - sketched: 2 x 2 mks)
 2. Design, using suitable sketches, a suitable undercarriage for the toy. Explain how the undercarriage will be attached to the body of the plane. (Design - sketched: 3/2/1 mks, Explain how to attach: 3 mks)

10 marks

- (iii) Describe the steps required to manufacture the wings and struts.
(2 valid steps described: 1st—3 mks & 2nd—2 mks)

5 marks

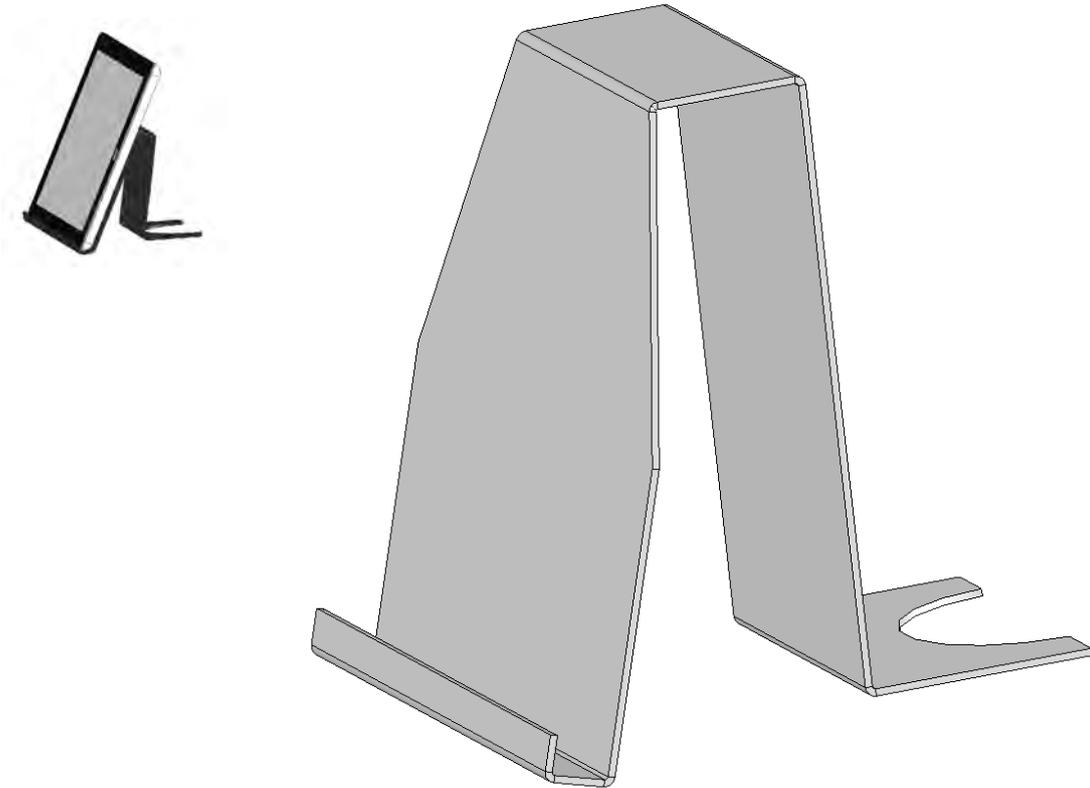
Correct Elevation view: 2 mks,
Proportions Correct: 3 marks (Tapered body: 1, Wings: 1, Tail: 1)



Correct Plan view: 2 mks,
Proportions Correct: 3 marks (Body: 1, Wings: 1, Tail: 1)

- OR -

1 (b) The sketch shows a design for an iPad stand, made from 5 mm acrylic sheet.



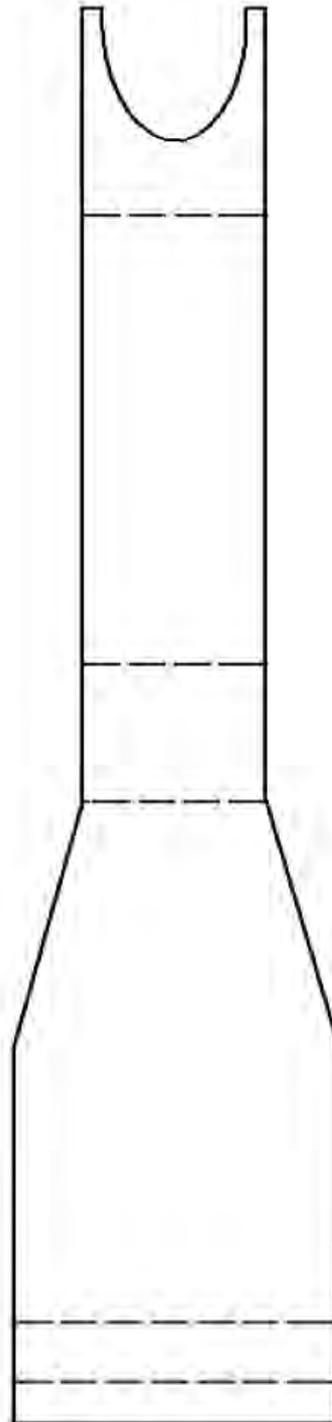
- (i) Make a well-proportioned sketch of a **development** of the stand.
Indicate clearly on your sketch the position of all bend lines.
(6 Correct Panels in Development: 6 mks, Proportions: 2 mks, Bend lines: 2 mks)
10 marks
- (ii) 1. Explain, using sketches, how the edges of the acrylic should be finished.
(Sketch how to finish: 5 mks (5/3/1))
2. Explain, using sketches, how the stand should be made from the acrylic sheet. (Sketch how to manufacture: 5 mks (5/3/1))
10 marks
- (iii) When testing the design, the iPad was found to slip out the side of the stand.
Using sketches, suggest a suitable method to prevent this from occurring.
(Valid solution: 2 mks, Sketch of suitable method: 3 mks (3/1))
5 marks

Development drawing - iPad stand

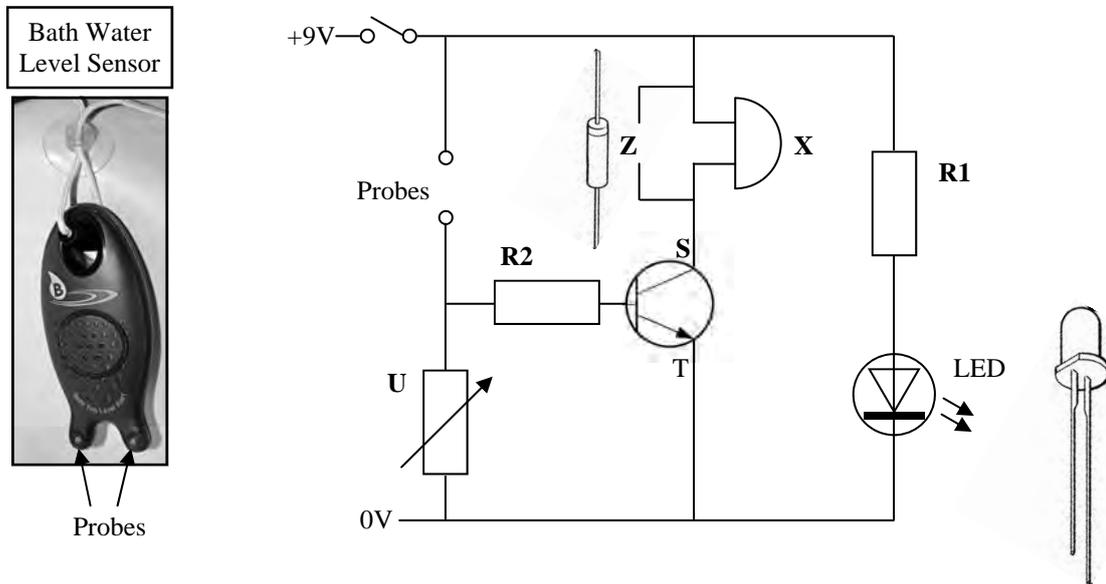
6 correct panels in development: 6 x 1 mark

Correct proportion: 2 marks

Hatched bend lines: 2 marks



2 (a) The sketch shows an electronic circuit, for a water level detector, to be housed in the design shown. The circuit will alert the user when the water level in a bath reaches a set height.



- (i) Identify the component at **X**. (Bell / Buzzer: 2 mks)
- (ii) Name, and sketch the symbol for, the additional component required at **Z** to prevent component **X** from damaging the transistor. (Name: Diode - 2 mks, Correct symbol: - 2 mks)
- (iii) Name the legs of the transistor, labelled **S** and **T**. (S:Collector - 2 mks, T:Emitter - 2 mks)
- (iv) State **two** ways in which the cathode of the LED can be identified on the component. (Short Leg: 2 mks, Flatside: 2 mks)
- (v) Explain why component **U** is required in the circuit. (Adjust sensitivity/set trigger level: 3 mks)
- (vi) A 330Ω resistor is required at **R1** and a $2k2$ resistor is required at **R2**. Using the colour code table below, state the colour codes for each of these resistors.

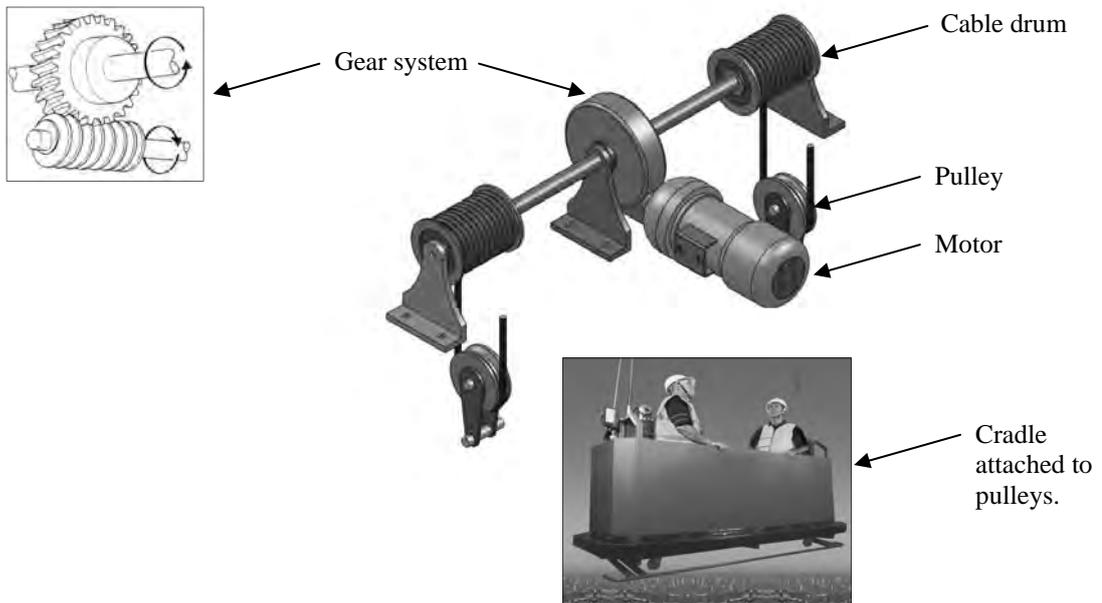
Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Grey	8
Yellow	4	White	9

R1(330Ω): Orange, orange, brown - 1,1,2 mks)

R2($2k2$): Red, red, red - 1,1,2 mks)

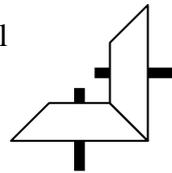
- OR -

2 (b) The sketch shows a mechanism used to raise and lower a 2 person maintenance cradle on the outside of a tall building.

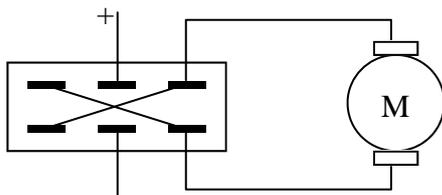


(i) Name the mechanism shown in the gear system and state **two** advantages in using this gear system in this situation.
 (Worm & worm wheel: 3 mks, 2 advantage: 2 x 3 mks - no slippage, high torque, low speed)

(ii) Name and sketch an alternative gear system which will turn the direction of rotation by 90°.
 (Name: 2 mks - bevel gear, sketch: 2 mks)

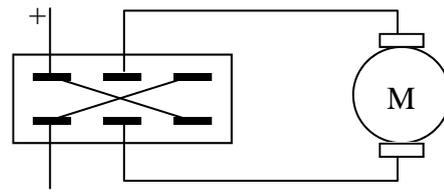


(iii) A working model of the controls used to raise and lower the cradle uses a DPDT switch and motor. Copy the symbols for the switch and motor below and sketch how they should be connected to allow the motor turn clockwise and anticlockwise.



DPDT switch

OR



DPDT switch

(Valid wiring diagram: Correct connections on sketch: 6 mks)

(iv) The cradle is intended to remain outdoors in all weather.
 Name a suitable material from which the cradle could be manufactured and state **two** reasons for your choice of material.
 (Suitable name material: 2 mks, Valid reason 1: 2 mks, Valid reason 2: 2 mks)

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

- (a) Web based social networking services have become an important part of the internet.
- (i) Outline, using **two** examples, the services provided by these sites.
(Service/example 1: 5 mks, Service/example 2: 5 mks.)
- allow share interests, email, instant msg, 'real'time communication, chat,
Offer virtual world/communities, etc.
- (ii) Explain, using **two** examples, the impact these services have had on society.
(Explain impact/example 1 :5 mks, Explain impact/example 2 :5 mks.)
- sharing interest/information/ideas/news without censorship, Worldwide (no borders),
co-operation possible, instant upload of photos/videos of events, etc.
- (iii) In relation to these services explain any **two** of the terms:
(Any two explained: 2 x 5 mks)
- Profile, - a personal webpage, personal details, photo, interests, etc.
 - Privacy, - allow limited access to 'friends, prevent others accessing info, etc.
 - Identity theft, - personal info / credit card info, bank details - stolen, etc.
 - Blog - **web log**, discussion site on the www consists of posts/entries,
A personal-public diary.

(30 marks)

- (b) WiFi technology has become common place in recent years.



- (i) Explain what is meant by WiFi technology.
(WiFi explained: 5 mks (5/3/1))
- wireless connection for computers/phones to internet /email/facebook, etc.
- (ii) In relation to WiFi explain the term 'access point (hotspot)'
(Access point explained: 5 mks (5/3/1))
- location where WiFi available
- (iii) Outline, using **two** examples, the benefits of WiFi technology.
(2 benefits outlined / examples: 2 x 5 mks (5/3/1))
- access internet for free / access services without wired connections, etc.

(20 marks)

4. Control Systems & Technology and Society

The Mars Science Laboratory 'Curiosity' is a mobile robot intended to explore the surface of Mars.

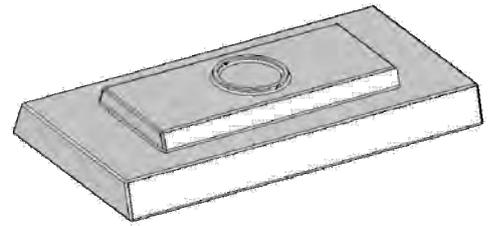


- (a) (i) Explain, giving **two** reasons, why a robot is required to explore the surface of Mars.
(Explain reason 1: 5 mks, Explain reason 2: 5 mks.)
- environment unsuitable for humans, too expensive to send humans, etc.
- (ii) A nuclear power source will generate electricity for the robot.
Explain briefly, why this is the most appropriate energy source for use on Mars.
(Explain: 5 mks)
- compact, long lasting, no combustion, alternatives not viable, etc.
- (iii) An on-board computer will **monitor** and **control** the robot's operations.
Explain briefly, how the robot could carry out each of these functions.
(Explain 'monitor': 5 mks, Explain 'control': 5 mks.)
- monitor: use of sensors to detect/sense/measure a given operation, etc.
- control: use of motors, robot arms, computer programmes, etc. to affect change
- (b) (i) Robots are commonly used in industry.
Outline, using **two** example, where robots are used in industry.
(Outline /example 1 :5 mks, Outline example 2 :5 mks.)
- suitable examples: manufacturing, sensing, exploring, rescue, etc.
- (ii) Outline **two** areas of expertise, required by operators, in order to service and maintain industrial robots.
(Area of expertise outlined 1 :5 mks, Area of expertise outlined 2 :5 mks.)
- programming, engineering, design, component manufacturing, etc.
- (iii) Outline **one** example of the use of a robotic device in the home.
(1 suitable example: 5 mks)
- vacuum cleaner, etc.

(50 marks)

5. Design and Manufacture

A student is required to manufacture a working model of a hovercraft using the vacuum forming mould shown.



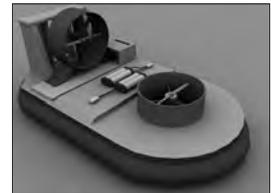
- (a) (i) Describe, with the aid of sketches, the steps required to manufacture the mould.
(2 appropriate steps sketched: 2 x 3 mks)
- marking out, cutting, joining, etc.

Name the materials, tools and processes used.
(materials/tools/process named: 3 x 2 mks)
- MDF, named tools, named process, etc.

- (ii) Describe, with the aid of sketches, **two** modifications to improve the mould design.
(Modification sketched 1: 3 mks, Modification sketched 2: 3 mks)
- tapered edges, air holes drilled, etc.
- (iii) Describe, with the aid of sketches, the steps required to vacuum form the body of the hovercraft from a sheet of 3 mm acrylic.
(Describe with sketches any 2 steps: 4 mks, 3 mks)
- any two steps associated with vac forming.

(25 marks)

- (b) (i) Describe, with the aid of sketches, the steps required to motorise the hovercraft for lift.
(Describe with sketches any 2 steps: 4 mks, 4 mks)
- construction and installation of horizontal motorised fan.



- (ii) Describe, with the aid of sketches, the steps required to motorise the hovercraft for forward motion.
(Describe with sketches any 2 steps: 4 mks, 4 mks)
- construction and installation of vertical motorised fan.
- (iii) Sketch a suitable circuit diagram to operate the motors from a single power source.
(Suitable circuit diagram: 9 mks)
- Appropriate circuit diagram: 3mks
- Correct component symbols: 6 mks (Motors(2), Switch(2) & Battery(2))

(25 marks)

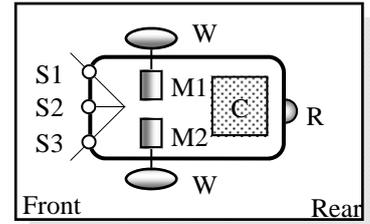
6. Control Systems

The graphics show a student design for a light sensing buggy.
The buggy contains the following parts:

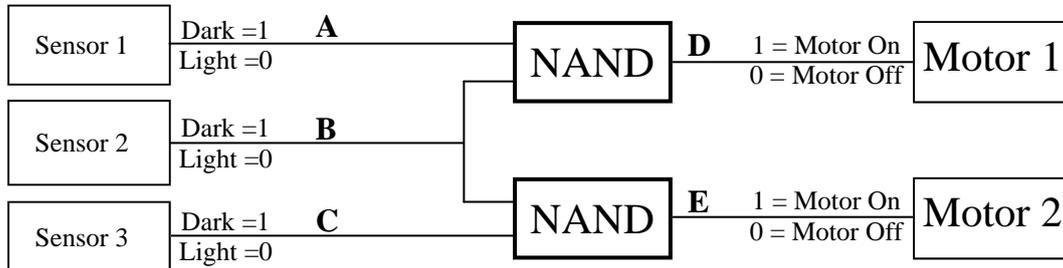
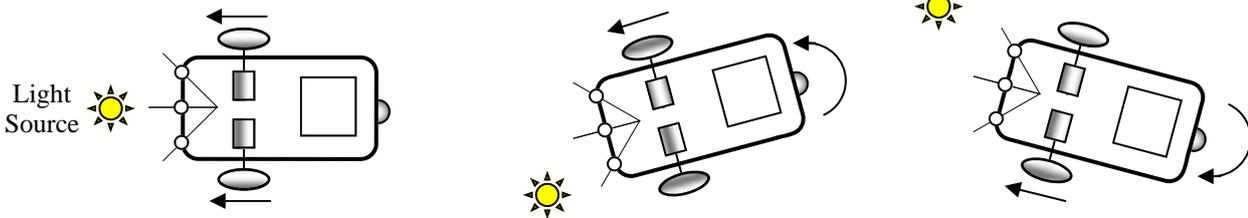
- 3 light sensors (S1, S2 & S3),
- two motor driven wheels (W),
- one free turning rear wheel (R),
- a suitable control circuit (C).



PLAN View



The buggy is designed to move forward or turn towards a light source by running one or both motors, controlled by the system shown.



- (a) (i) Name a suitable component for use at S (light sensor).
(LDR/ORP12: 4 mks)
- (ii) What property of this component changes with changing light levels?
(Resistance: 4 mks)
- (iii) The light sensors will be placed in a 'potential divider' in the circuit.
Explain what is meant by a 'potential divider' and why a potential divider is required.
(Potential divider explained: 4 mks, Why PD required: 4 mks)
- (b) (i) Shown is an incomplete truth table for the buggy control system.
The system uses NAND gates (AND followed by NOT).
Copy and complete the truth table for the system shown in your answer book.
(Correct entries in table: 10 x 2 mks)

A	B	C	D	E
1	1	1	0	0
1	1	0	0	1
1	0	0	1	1
0	0	1	1	1
0	0	0	1	1

(ii) From the truth table identify the sensor states (light or dark) which will cause the buggy to turn left or right.

(Correctly identified entry: 4 mks)

- Table entry: A=1, B=1 & C=0. / A&B dark, C light.

(c) Outline a suitable modification to this system which will turn on a flashing LED only when both motors are turned off.

(10 mks)

- 2 mks: Motors off when D=0 & E=0,

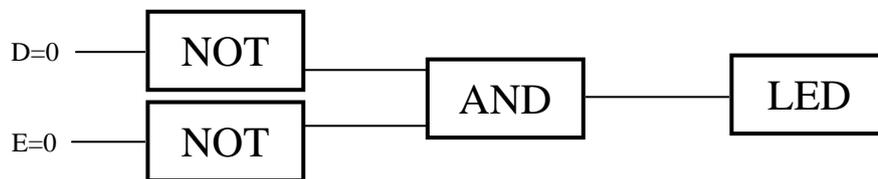
2 mks: Output from D to a NOT gate

2 mks: Output from E to a NOT gate.

2 mks: Connect output from both NOT gates to an AND gate

2 mks: Connect output from AND gate to LED.

(50 marks)



OR



Any valid alternative (10 mks)