Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination, 2017

Technology

Higher Level

Wednesday, 21 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

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 25 questions from this section - all questions carry equal marks.   **100 marks**
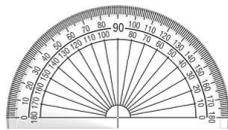
1. A view of a mobile phone is shown.

    Name the type of view shown and state **one** advantage of this type of view.

    View: _____
    _____
    _____

    Advantage: _____
    _____
    _____
    _____

2. Name the **two** drawing instruments shown.
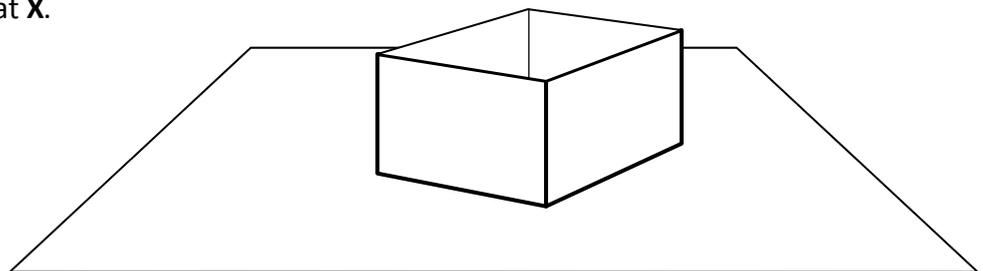
    (i)   (ii)

    (i): _____
    _____
    _____
    _____

    (ii): _____
    _____
    _____
    _____

3. State **one** way in which data on a computer can be protected from unauthorised access.

    Answer: _____
    _____
    _____
    _____
    _____
    _____
    _____

4. Shade the open container shown to suggest a light source at **X**.

    Ⓧ

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

    (i)   (ii)

    (i): _____
    _____
    _____
    _____

    (ii): _____
    _____
    _____

6. State **two** advantages of using steel beams, with the profile shown, when constructing buildings.

(i): _____
_____
_____
_____

(ii): _____
_____
_____
_____

7. State **one** advantage and **one** disadvantage of using MDF in constructing a project.

Advantage: _____
_____
_____
_____

Disadvantage: _____
_____
_____
_____

8. State **two** properties of a material suitable for the manufacture of the handle shown.

(i): _____
_____
_____
_____

(ii): _____
_____
_____
_____

9. Name **one** modern material used in sports car design

and

state why this material is used.

Material: _____
_____
_____
_____

Reason: _____
_____
_____
_____

10. Name the process used to manufacture the safety helmet shown from a single piece of plastic.

Process: _____
_____
_____

11. State **two** specific safety precautions which should be observed when soldering electronic components.
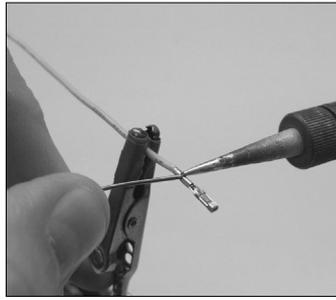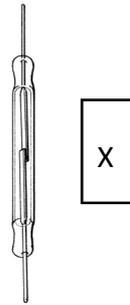
(i): _____
_____
_____
_____

(ii): _____
_____
_____
_____

12. The switch shown can be activated by component X.
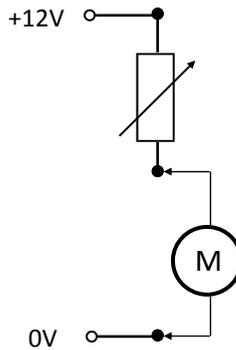
Name component X.

X

X: _____
_____

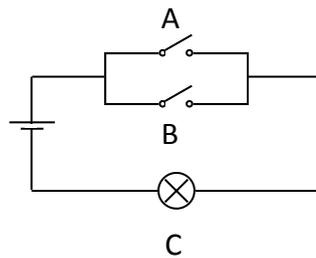13. In the circuit shown, state what is being measured by the meter M

and

name the units used in this measurement.

+12V

M

0V

Answer: _____
_____
_____

Units: _____
_____
_____

14. Complete the truth table for the circuit shown.

A

B

C

INPUT		OUTPUT
A	**B**	**C**
Open	Open	
Open	Closed	
Closed	Open	
Closed	Closed	

15. What property of a thermistor changes with changing temperature?

NTC 5D-11

Property: _____
_____

16. In the system shown, if the driver is rotating at 100 RPM, calculate the speed of the driven wheel.
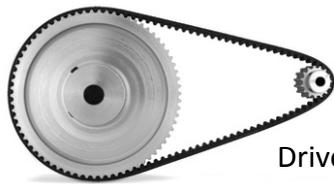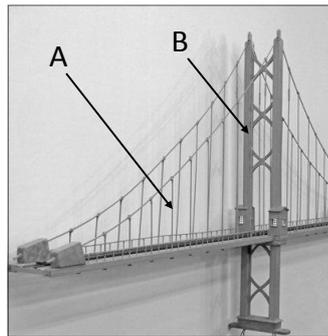
Driven 15 T

Driver 60 T

Answer: _____
_____
_____

17. Name the forces experienced by the cable (A) and by the tower (B) in the suspension bridge shown.

A

B

A: _____
_____

B: _____
_____

18. Name the tool shown

and

state the function of this tool.

Name: _____
_____
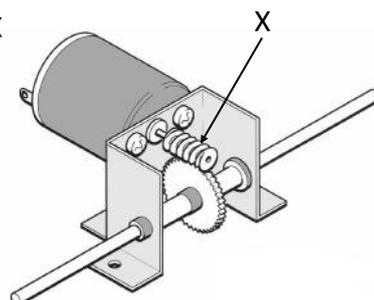
Function: _____
_____
_____

19. Indicate clearly on the tweezers shown the location of the fulcrum (F) and the effort (E).

20. Name the gear shown at X

and

state **one** advantage of using this gear in this situation.

X

X: _____
_____

Advantage: _____
_____
_____
_____

21. Give **two** reasons why plastics should be recycled.

(i): _____

_____

_____

(ii): _____

_____

_____

22. Name **two** energy conversions taking place when a drone **is in flight**.

(i) From: _____

To: _____

(ii) From: _____

To: _____

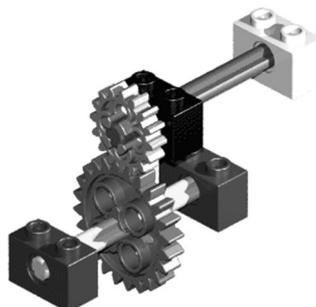23. State **two** uses for an integrated chip (IC) in modern toys.

(i): _____

_____

_____

_____

(ii): _____

_____

_____

24. State **two** ways in which smart TVs have changed the way in which we watch television.
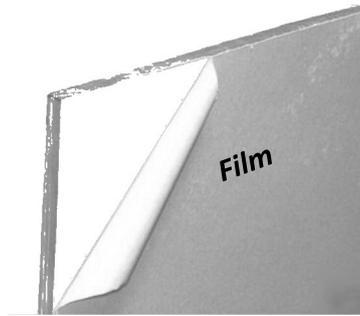

(i): _____

_____

_____

_____

(ii): _____

_____

_____

25. State **two** reasons why plastic is used to manufacture components in the system shown.

(i): _____

_____

_____

_____

(ii): _____

_____

_____

26. State the purpose of the film on the acrylic sheet shown.

Film

Purpose: _____
_____
_____
_____
_____
_____
_____
_____
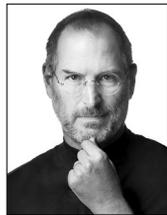
27. State **one** advantage and **one** disadvantage of using a hot melt glue gun to join acrylic sheets.

Advantage: _____
_____
_____
_____

Disadvantage: _____
_____
_____
_____

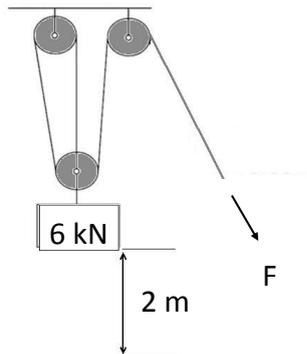28. Name the technology company most associated with each of the people shown.
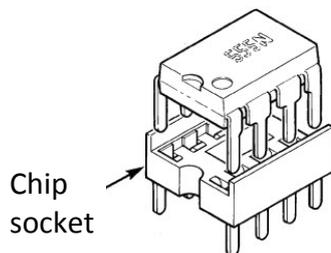

Steve Jobs

Bill Gates

Steve Jobs: _____
_____

Bill Gates: _____
_____

29. Calculate the force F required to lift the 6 kN load a height of 2 m using the pulley system shown.
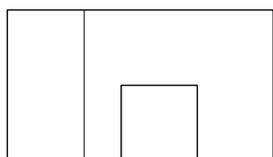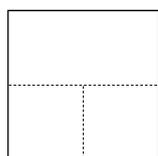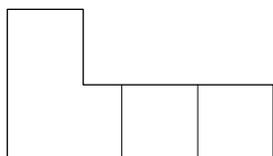

6 kN
2 m
F

F: _____
_____

30. State **one** reason why a chip socket should be used when attaching a chip to a circuit board.
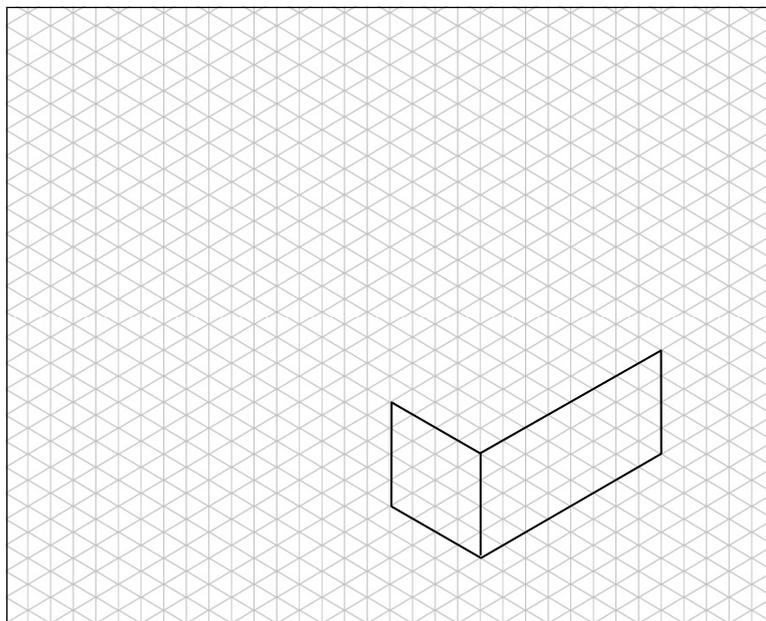

Chip socket

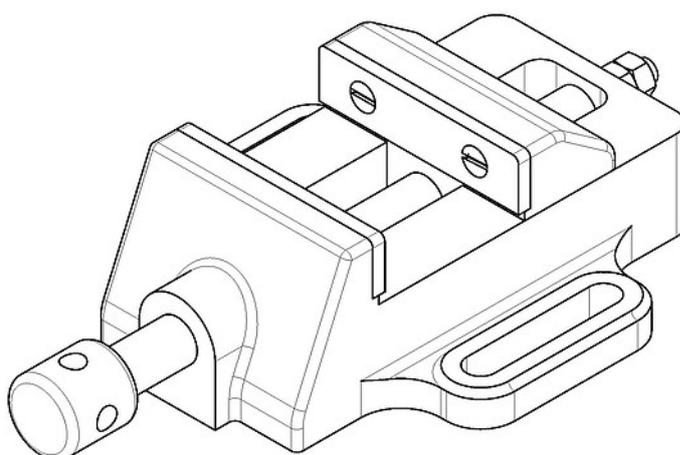Reason: _____
_____
_____
_____
_____
_____
_____

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

Orthographic projection

32. Insert **four** main dimensions on the sketch of the drill vice shown.

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Technology

Higher Level

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Section B and Section C
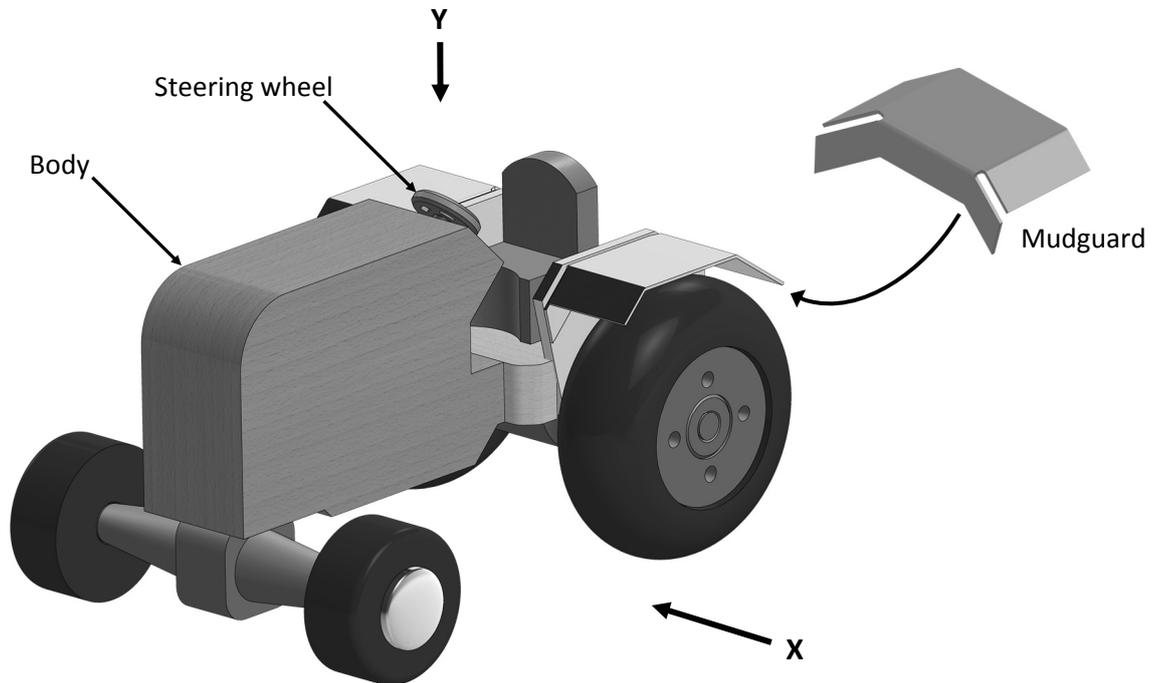
Section B   -   50 marks

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 graphic shows a design for a toy tractor. The toy is made from wood, metal and plastic.
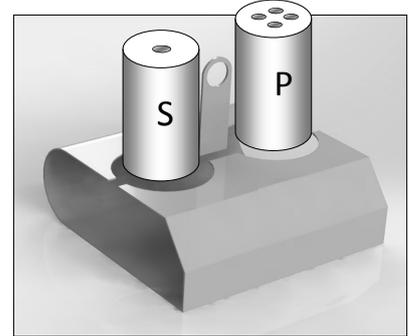

(i)   Make well-proportioned sketches of the following views:
            (The steering wheel need not be included).

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

          2.   A **plan** in the direction of arrow **Y**.

                                                                          (10 marks)

(ii)   1.   Mudguards are shown in the design above.
                  Suggest a suitable material for the mudguards and explain using
                  notes and sketches how they could be attached to the body of the
                  toy tractor.
                  Name any tools required and state the processes used.

          2.   Make a well-proportioned sketch of a **development** of the mudguard.
                  Indicate clearly on your sketch the position of all cutting and bend lines.
                                                                          (10 marks)

(iii)   A design modification is required to add an exhaust to the tractor.
          Sketch a suitable exhaust and suggest how to attach your design
          to the body of the tractor.
          Name any tools required and state the processes used.

                                                                          (5 marks)

1 (b)   The graphics show a design for a salt and pepper stand to be manufactured from 3 mm acrylic.

Handle
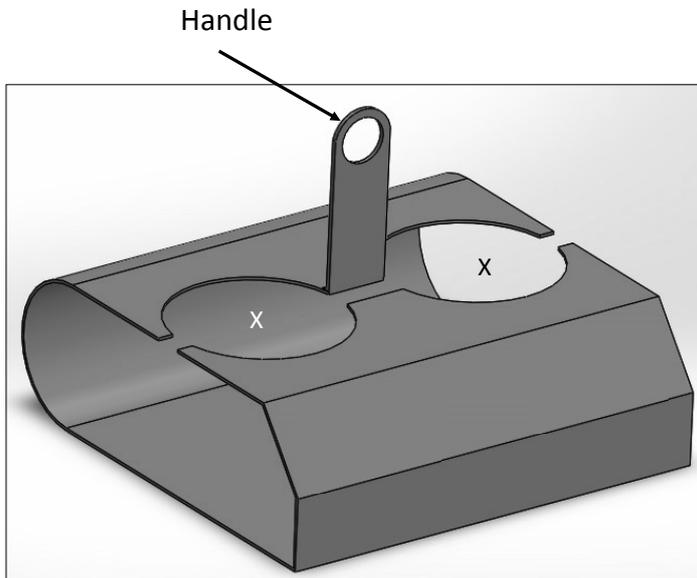

Salt and pepper stand

Stand with salt and
pepper containers

(i)   Make a well-proportioned sketch of the **development** of the stand.
Indicate clearly on your sketch the position of all cutting and bend lines.

(10 marks)

(ii)   1.   Explain, using sketches, the steps required to produce the
openings X, for the salt and pepper containers, in the
3 mm acrylic sheet.
Name any tools required and state the processes used.

2.   Describe, using sketches, how to manufacture the stand
from 3 mm acrylic sheet.
Name any tools required and state the processes used.

(10 marks)

(iii)   A design modification is required to prevent the handle from bending
when the stand is lifted.
Describe, using sketches, a suitable modification to solve this problem.
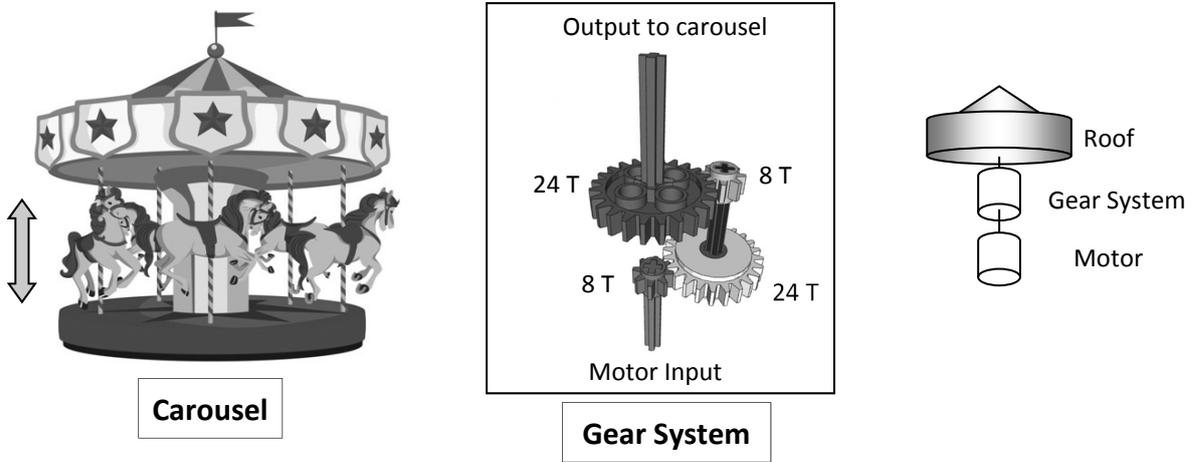
(5 marks)

2 (a) The circuit design shown is to be used in a security system.
If the laser beam shining on component B is interrupted, the system is activated.

+9V

A

C

B

D

Laser
pointer

0V

Image 1

Image 2

X
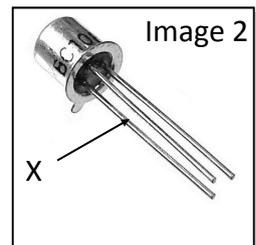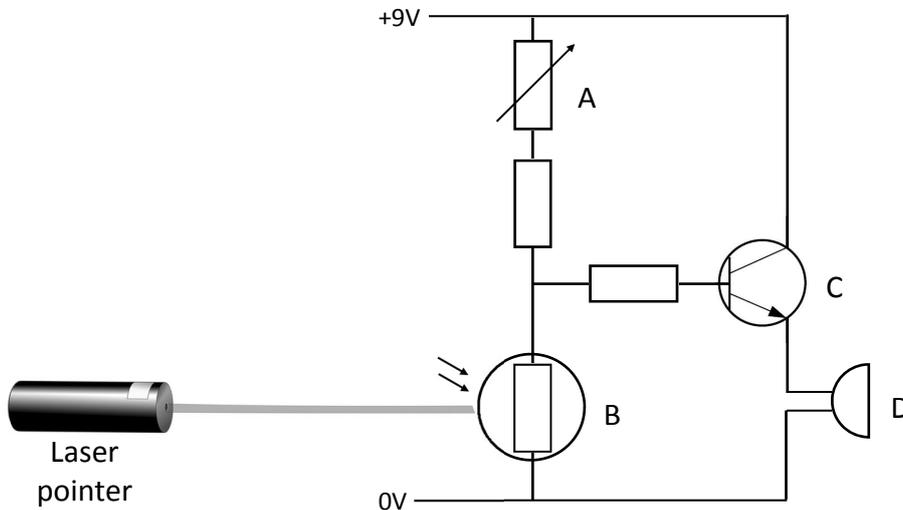
(i)   Name the components labelled **A, B, C** and **D** in the circuit.

(8 marks)

(ii)   Explain why component **A** is required in the circuit.

Component **A** has three pins (as shown in Image 1).
Explain which pins should be used when constructing this circuit.

(8 marks)

(iii)   Identify the leg of component **C**, marked X (closest to the tab) as shown in Image 2.

State **one** function of component **C** in this circuit.

(6 marks)

(iv)   A suggested modification to this circuit requires that component **D** should
be 'Latched'.
In relation to this circuit explain the term 'Latch'.

(3 marks)

2 (b) The graphic shows a design for a working model of a fairground carousel.
A motor drives a gear system, contained in the central support, which turns the carousel.
The horses move up and down using a mechanism linked to the turning carousel.

Output to carousel

24 T   8 T

8 T   24 T

Motor Input

Gear System

Carousel

Roof

Gear System

Motor

(i)   If the motor turns at 360 RPM calculate the speed of rotation of the carousel.

(6 marks)

(ii)   The speed of rotation of the carousel is too high using the system shown.
Sketch a modification to the gear system shown to reduce the speed of
rotation of the carousel to 10 RPM.

(6 marks)

(iii)   Sketch a design for a mechanism to allow the horses to move up and down as
the carousel turns.
Name the parts of any mechanism used in your design.

(8 marks)

(iv)   The image below shows two mechanisms used in a real world carousel.
Name **one** of these mechanisms.

(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 & Society

(a)   "According to new EU targets, Ireland will have to cut its
greenhouse gas emissions by a third by 2030."

The most recent emission figures for Ireland show:

> *Agriculture is the single largest contributor to the overall*
> *emissions, at 29.2% of the national total, followed by*
> *Energy (power generation & oil refining) at 21% and*
> *Transport also at 21%.*

epa
Environmental Protection Agency

Select **two** of the areas identified above and **in each case** outline **two** technologies
which could help to reduce our greenhouse gas emissions.

(20 marks)

(b)   "Many schools use modern technologies in the day to day operation of the school."

Outline **two** ways in which technology has changed the way schools operate.

(10 marks)

(c)   "Many modern household devices can connect to a network wirelessly, allowing
them to send and receive data."

Name **two** household devices which can use this technology and outline **two**
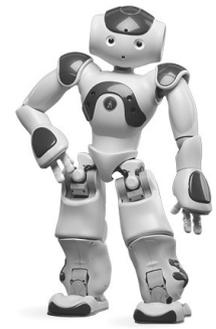advantages of this type of technology for a consumer.

(10 marks)

(d)   "*Always-on* mobile communications have become a feature of modern life."

Outline **one** advantage and **one** disadvantage of *always-on* mobile communication.

(10 marks)

4. Control Systems and Technology & Society

(a) The NAO humanoid robot shown is programmable, interactive and can act independently of a human controller.

    (i) Outline **two** ways in which this robot could 'interact' with people.

    (ii) Outline **two** functions of a microprocessor in this robot.

(20 marks)

(b) Robotic devices have become more popular in recent years.
Examples include: industrial robots, military robots, medical robots and transport robots.

    (i) In the case of any **two** of the examples above, outline the functions of these robots.

    (ii) In the case of any **one** of the examples above, outline **one** advantage and **one** disadvantage of using these robots.

    (iii) In relation to robotics, explain any **two** of the following terms:

        sensor, actuator, feedback, control software.
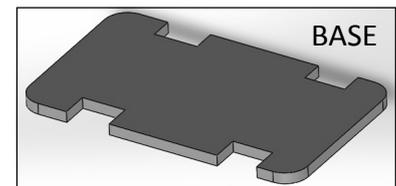
(30 marks)

5. Design & Manufacture

A student intends to manufacture a motorised model car based on the design shown.

SHELL

BASE

(a) (i) Describe, with the aid of sketches, the steps required to manufacture the body shell from a suitable material. *Name any tools required and state the processes used.*

    (ii) Describe, with the aid of sketches, how the body shell could be easily attached and detached from the base shown.

(25 marks)

(b) (i) Describe, with the aid of sketches, how the model could be motorised using a DPDT switch and a motor with an attached gearbox.

    (ii) Describe a modification to include a suitable circuit which will turn on the front lights when moving forward and the rear lights when moving backward.

(25 marks)

6. Control Systems

(a) A system diagram, to monitor the seat belt usage in a **two seat** smart car, is shown. The system will produce both a visual and an audible warning if a seat is occupied but the seat belt is not closed.

Each seat sensor (SS) will output a '1' when that seat is occupied and a '0' if vacant. Each seat belt sensor (SB) will output a '1' if that belt is closed and a '0' if open.

Visual Warning Display
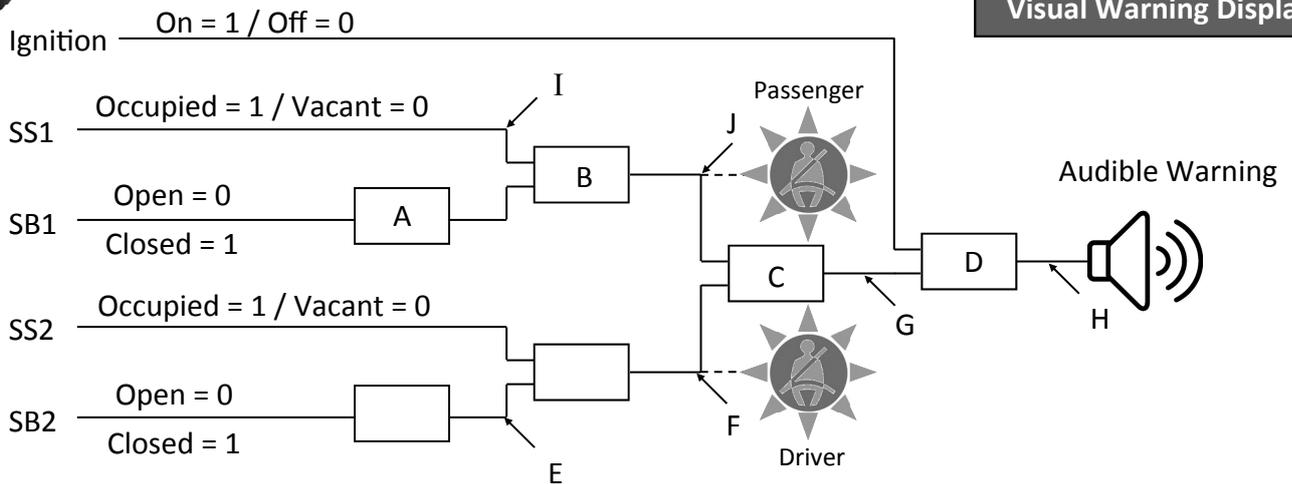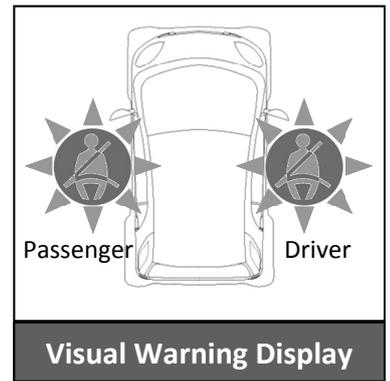
(i) Name the logic gates required at A, B, C and D.
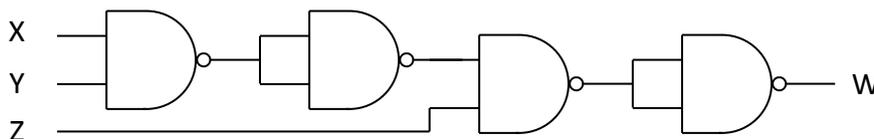(ii) Draw a truth table for each of the logic gates at A and D.

(24 marks)

(b) For the system shown, copy and complete the truth table for the following situation: (indicate if each of the positions marked are at '1' or '0')

'The ignition switch is on, the driver seat is occupied but the seat belt is open, while the passenger seat is vacant but the seat belt is closed.'

E	F	G	H	I	J

(12 marks)

(c) A NAND gate is a combination of an AND gate and a NOT gate.
Copy and complete the truth table below for the combination of gates shown.

	INPUT		OUTPUT
X	Y	Z	W
			1

(14 marks)