



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination, 2017

Technology

Higher Level

Wednesday, 21 June
Afternoon, 2:00 - 4:00

Section B and Section C

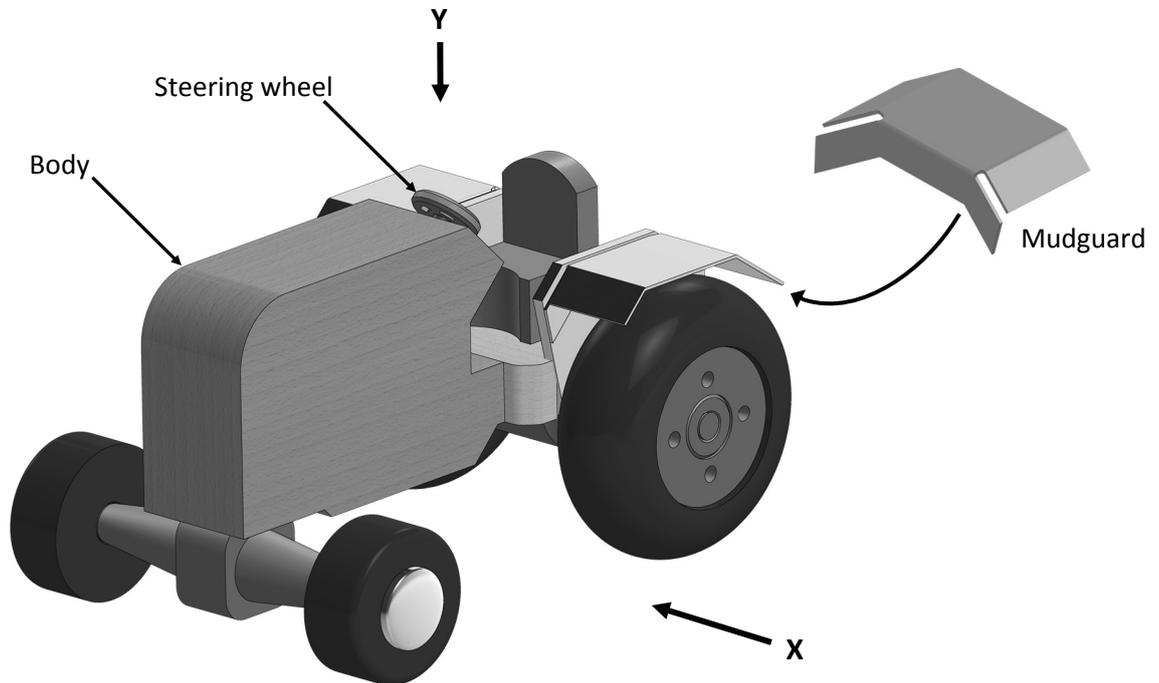
Section B - 50 marks

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.

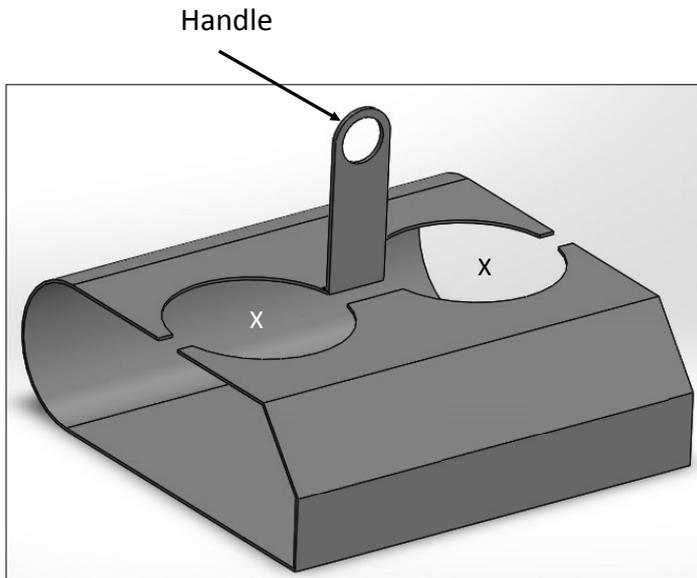
1 (a) The graphic shows a design for a toy tractor. The toy is made from wood, metal and plastic.



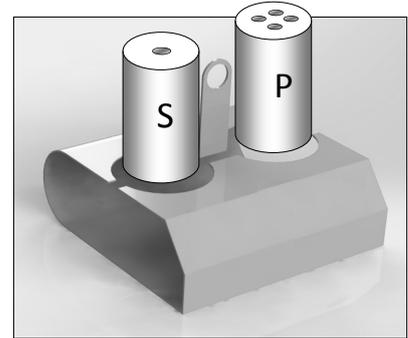
- (i) Make well-proportioned sketches of the following views:
(The steering wheel need not be included).
1. An **elevation** in the direction of arrow **X**.
 2. A **plan** in the direction of arrow **Y**.
- (10 marks)
- (ii)
1. Mudguards are shown in the design above. Suggest a suitable material for 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)

- OR -

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



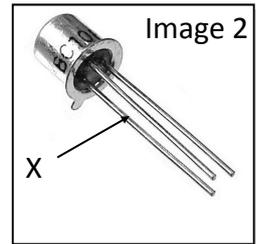
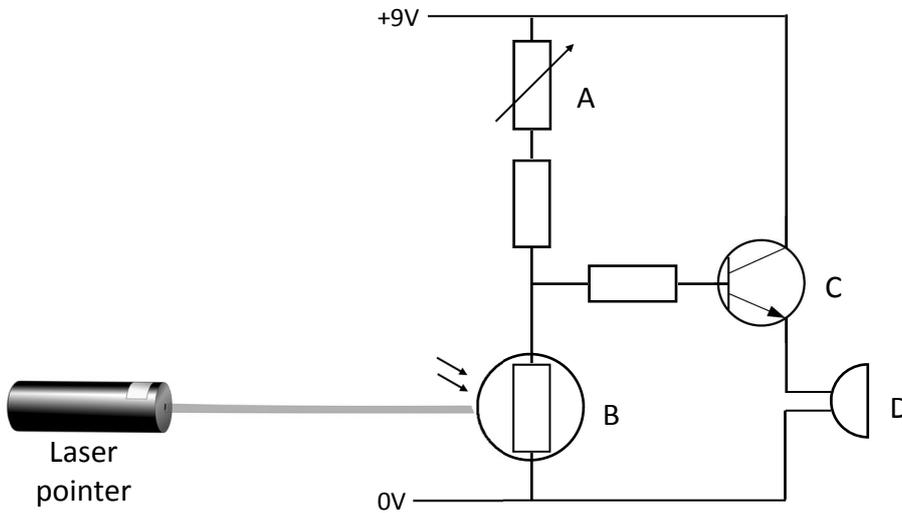
Salt and pepper stand



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)

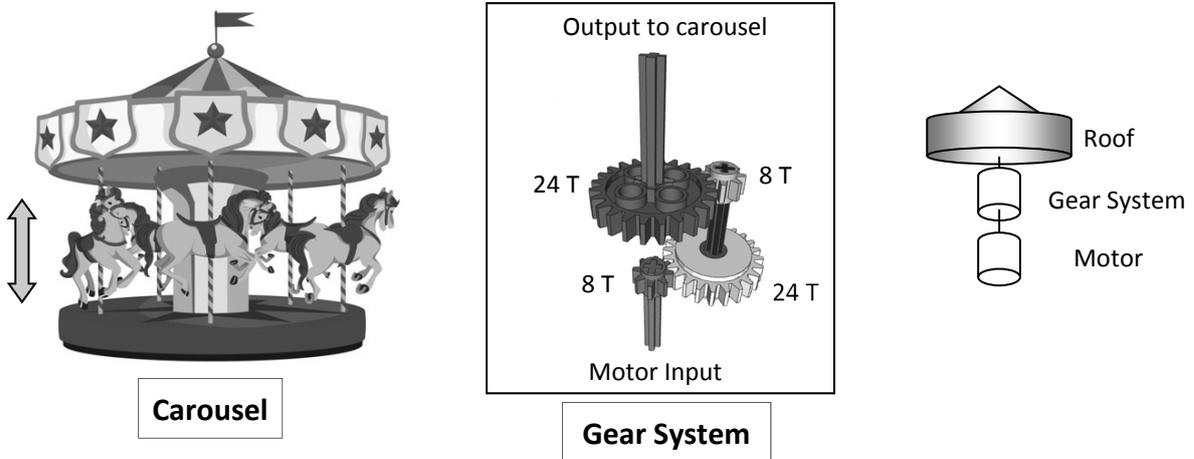
- 2 (a) The circuit design shown is to be used in a security system.
If the laser beam shining on component B is interrupted, the system is activated.



- (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)

- OR -

- 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.



- (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%.



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.

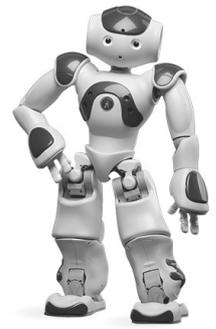
(10 marks)

- (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.

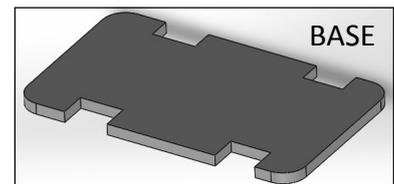
(30 marks)

5. Design & Manufacture

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



- (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.

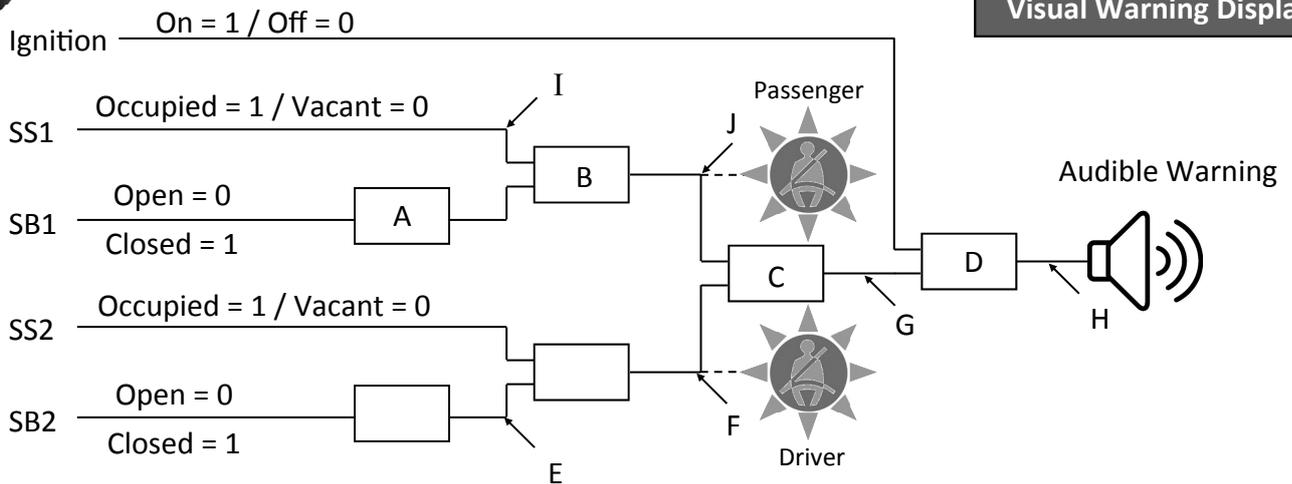
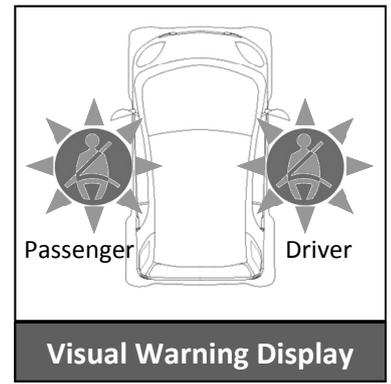
- (ii) Describe a modification to include a suitable circuit which will turn on the front lights when moving forward and the rear lights when moving backward.

(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.



- (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)

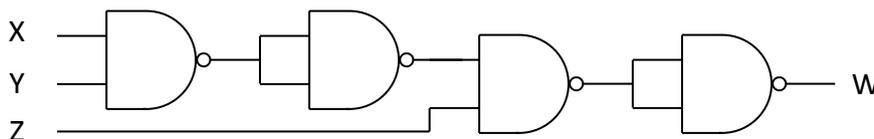
- (b) For the system shown, copy and complete the truth table for the following situation:
 (indicate if each of the positions marked are at '1' or '0')

'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)