



Leaving Certificate Examination

Technology
Higher Level

Sample Paper
Duration 2.5 hours

There are **three** Sections in this paper. Attempt **all three** Sections.

Section A: Core - Short-answer questions.

Section B: Core - Long-answer questions.

Section C: Options - Long-answer questions.

Section A - Core (72 marks)

Instructions:

- (a) Answer **any twelve** questions in the spaces provided.
All questions in Section A carry 6 marks.
- (b) Draw all sketches in pencil.
- (c) Hand up this booklet at the end of the examination.
- (d) Write your examination number in the box provided
and on all other pages used.

Examination Number:

Centre Number

Section	Mark
Section A	
Section B	
Section C	
Total	
Grade	

Section A. Answer *any twelve* questions. All questions carry 6 marks.

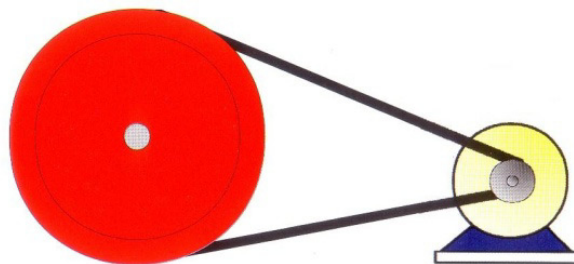
1. Explain the concept *carbon footprint* and give one example of how to reduce the carbon footprint of a product.



2. Explain why plywood, as shown, is a more suitable material than natural wood in certain situations. Suggest a situation and give reasons for its suitability.



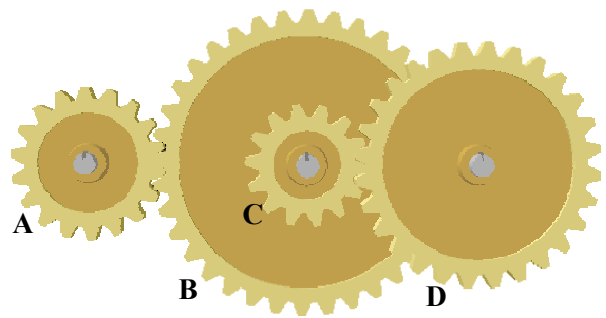
3. On the sketch below, show one method for tensioning the belt and describe how the method shown holds the belt in tension.



4. (i) Using the following information, calculate the gear ratio of the gear train shown.

Teeth - **A**:18; **B**:36; **C**:14; **D**:28.

Calculation:

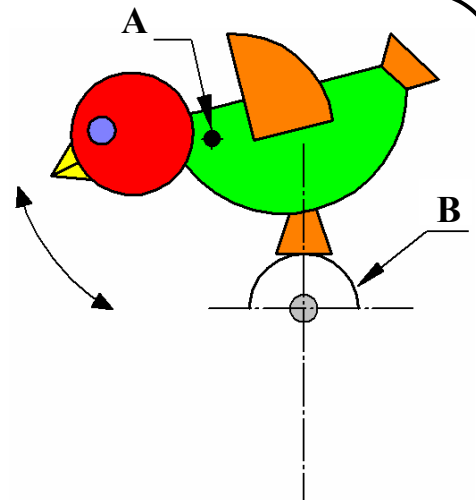


- (ii) If the speed of gear A is 40 rev/min, calculate the speed of gear D.

Calculation:

5. A cam mechanism is required to make the toy bird shown pivot smoothly about point A.

- (i) Complete a suitable cam profile on B to provide the required movement.
- (ii) Show on your cam profile where the maximum lift occurs.



6. What is meant by *defragmenting* a hard disk drive in a computer?

Why is it necessary to defragment a disk?

7. Describe **two** specific safety precautions that should be observed when:

Cutting sheets of medium density fibreboard (MDF):

- (i) _____
- (ii) _____



Soldering electronic circuit boards:

- (i) _____
- (ii) _____

8. Give an example of each of the following and state **one** advantage of each:

- (i) composite material
- (ii) alloy

Composite material: _____

Advantage: _____

Alloy: _____

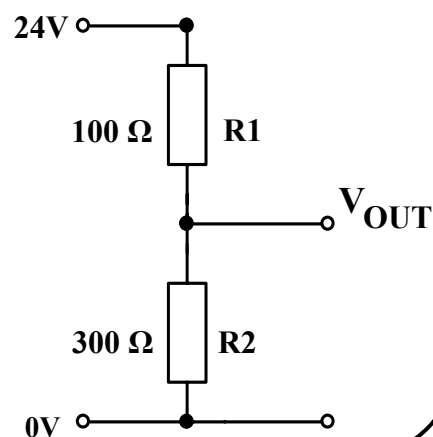
Advantage: _____

9. The resistor network shown is a potential divider.

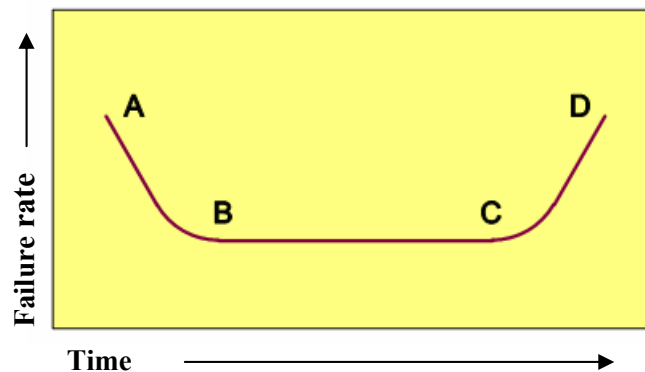
- (i) Suggest a reason for using a potential divider in a circuit.

- (ii) Calculate the value of V_{OUT} in the circuit shown.

Calculation:



10. The graph shows how the failure rate of a product can vary over its life cycle.



Explain what the regions A-B, B-C and C-D on the curve represent.

A-B _____

B-C _____

C-D _____

11. A control circuit to activate a relay when light levels increase is shown.

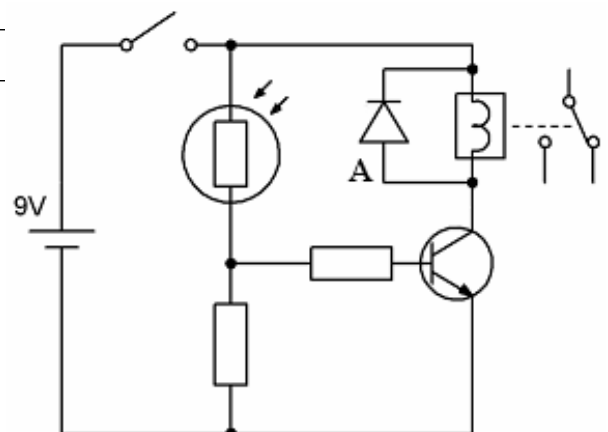
- (i) What is the purpose of diode A in the given circuit?

- (ii) To manufacture the circuit a choice has to be made between the following transistors:

BC 337 transistor (500mA) and

BC108 transistor (100mA).

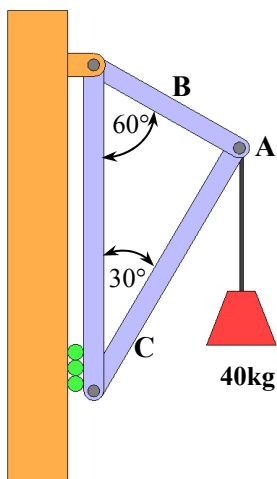
If the resistance of the relay coil is 50Ω ,
show, with calculations, which of the above
transistors is the most suitable:



Calculation:

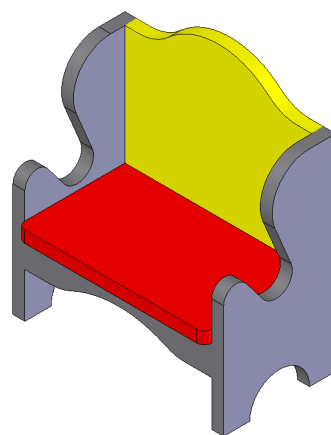
12. (i) Explain the difference between a **strut** and a **tie** in a structure.

- (ii) A mass which is simply supported by a frame is shown in the sketch. The pin **A** on the frame is in equilibrium. Determine the magnitude of the forces acting on members **B** and **C** of the frame.



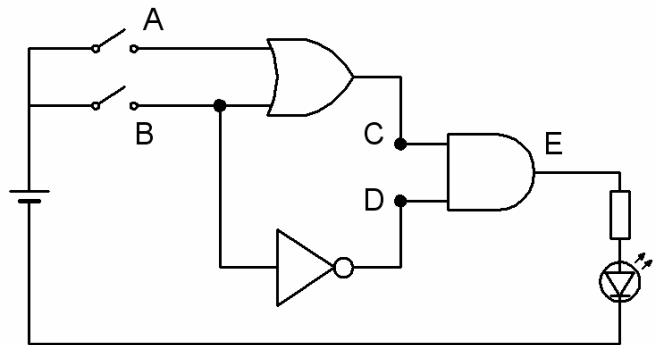
Calculation:

13. Make a well-proportioned freehand sketch of three principal orthographic views of the garden seat shown.



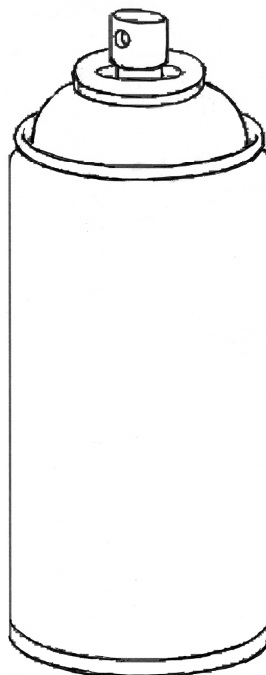
14. (i) Complete the truth table for the logic circuit shown.

A	B	C	D	E
0	0			



- (ii) Identify the arrangement of switches A and B which will cause the LED to light up.

15. Use **two** graphic techniques to enhance the graphic representation of the aerosol can shown.



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Section B - Core (48 marks)

Answer both questions.

Each question in Section B carries 24 marks.

Section C - Options (80 marks)

Answer two of the five options presented.

All questions in Section C carry 40 marks.

Instructions:

- (a) *Answer these questions in the answerbook provided.*
- (b) *Write your examination number on the answerbook.*
- (c) *Draw all sketches in pencil.*
- (d) *Hand up the answerbook at the end of the examination.*

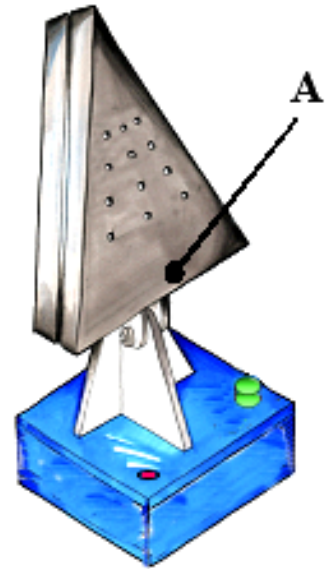
Section B - Core - Answer Question 2 and Question 3

Question 2 - Answer 2(a) and 2(b)

2(a) (i) Outline **three** reasons why the use of models is recommended when refining ideas during the process of designing.

2(b) A preliminary design of a fan for a computer workstation in a Technology room is shown.

- (i) Evaluate critically the preliminary design of the fan shown.
- (ii) Using notes and sketches, design an attractive alternative housing, as shown at **A**, that would improve the functioning of the fan. Outline the reasons for your chosen design.
- (iii) Describe the steps in the manufacture of the alternative fan housing that you have designed.



Answer 2(c) or 2(d)

2(c) (i) Draw a circuit diagram which will automatically turn on the fan when the temperature rises. Identify the input, process and output components of the circuit.

- (ii) The following changes are required in the circuit:
 - A master on/off switch
 - A means of adjusting the sensitivity of the circuit
 - A LED indicator to show that the fan is on

Draw a modified circuit to include these changes.

Note: It is not necessary to show values for components in the circuits at (i) and (ii) above.

OR

2(d) It is required to manufacture your proposed design of the fan.

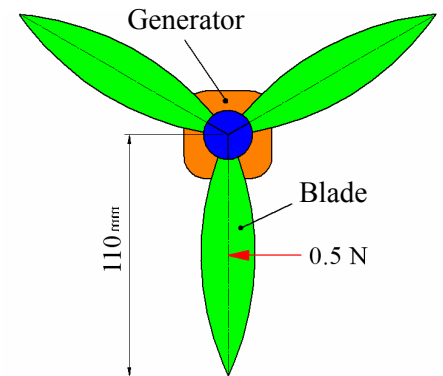
- (i) Choose which parts of the fan should be bought in and which parts should be manufactured in the Technology room and give reasons for your choices.
- (ii) Create a work breakdown structure (WBS) for the production of the fan.

Question 3 - Answer 3(a) and 3(b)

- 3(a)** (i) It is proposed that 20% of Ireland's electricity be produced from renewable sources by 2020. Discuss **three** reasons for this proposal.
- (ii) Describe the energy conversion that takes place in each of the following renewable energy sources:
- solar panel
 - wind turbine

3(b) Part of a student's design for a model of a wind turbine is shown.

- (i) Using notes and sketches show a mechanism that will increase the speed of the generator shaft relative to the blades.
- (ii) If the force acting on the midpoint of each blade is 0.5N, calculate the torque produced by the turbine blades. If the velocity ratio between the blades and the generator shaft is 1:3, calculate the torque exerted on the generator shaft.



Answer 3(c) or 3(d)

- 3(c)** (i) Discuss **two** quality costs that may be incurred by a manufacturing company to ensure that turbine blades are manufactured to meet highest quality standards.
- (ii) During lifetime use, turbines are dismantled for planned maintenance at specific intervals. Discuss how the planned maintenance interval is determined.

OR

3(d) The following schedule of tasks has been prepared by a company manufacturing a prototype of a wind turbine.

No	Task	E.S.T.	Length (weeks)	Dependent on
1	Sourcing turbine materials	week1	1 week	
2	Computer profiling blades (team 1)		2 week	1
3	Commissioning generator (team 2)		3 weeks	1
4	Finishing blades by team 1		2 weeks	2
5	Assembly of turbine		1 week	4 and 3
6	Testing of turbine		2 weeks	5
7	Evaluation		1 week	6

- (i) Complete the schedule for the Earliest Start Time (EST) and draw a Gantt chart of this schedule.
- (ii) Identify the latest date for commencing the commissioning of the generator (Task No.3) that will not delay the completion date of the project.

Section C - Options—Answer any two of the Options.

Option 1 - Applied Control Systems - Answer 1(a) and 1(b)

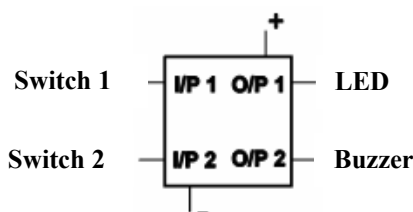
1(a) (i) Give **two** examples of how microprocessors may be used to conserve energy in the home.

For **each** example, explain how energy is conserved.

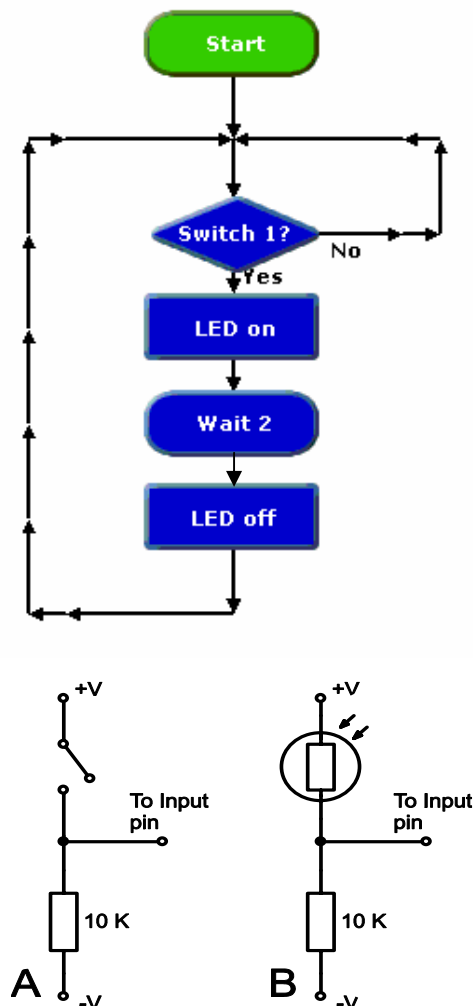
1(b) A program sequence for an egg timer is shown in the flowchart.

(i) Explain how the program operates.

(ii) Two settings are required on the egg timer - one to soft boil and one to hard boil the eggs. The soft boil setting waits 3 minutes and then turns on a LED. The hard boil setting waits 5 minutes and then turns on a buzzer. Based on the pin configuration for inputs and outputs shown below, draw a modified program flowchart to include both settings.



(iii) Distinguish between analogue and digital inputs. Which of the circuits A or B shown will provide a digital input to a PIC? Give reasons for your answer.



Answer 1(c) **or** 1(d)

1(c) (i) Automated manufacturing systems use a variety of robotic configurations.

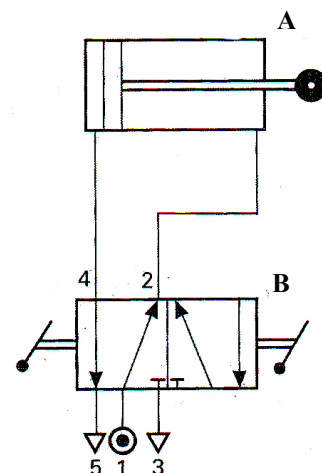
Describe, using notes and sketches, **Polar** and **Cylindrical** robotic configurations.

(ii) Describe the operation of a stepper motor and explain why it is suitable for open-loop control.

OR

1(d) (i) Describe **two** advantages of electro-pneumatic circuits over pneumatic circuits.

(ii) A circuit for a pneumatic clamp is shown. Identify components A and B in the pneumatic circuit and describe how the circuit operates.



Option 2 - Electronics and Control - Answer 2(a) and 2(b)

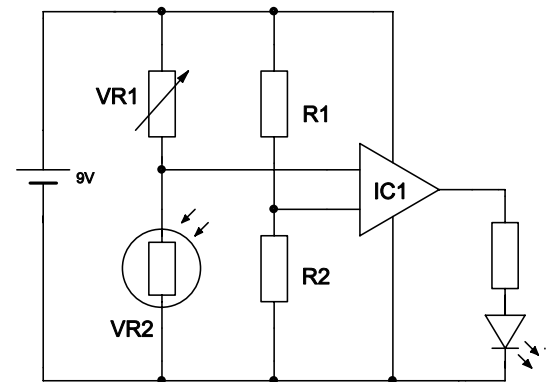
2(a) Portable electronic devices contribute to the well-being of many people.

- (i) Identify a portable electronic device used in each of the following areas:
 - health
 - transport
 - leisure
- (ii) For each device selected, describe in detail how the device contributes to the well-being of people.

2(b) A fish bowl is fitted with a circuit to indicate when the water needs to be changed. When the water becomes cloudy an indicator LED turns on.



- (i) Name the component **IC1** and describe its function.
- (ii) Explain how the sensitivity of the circuit can be adjusted to respond to different levels of cloudy water.
- (iii) When the circuit was tested, the LED was found to come on when the room was dark. Draw a modified circuit which will rectify this problem.



Answer 2(c) or 2(d)

- 2(c) (i) Explain what is meant by **each** of the following in relation to a DC motor:
- Back EMF
 - Efficiency
- (ii) The output power rating for a DC motor operating at 220 volts is 1kW. Calculate the efficiency of the DC motor if the resistance of the coil is 50Ω.

OR

- 2(d) (i) Describe an application for **one** of the following:
- Voltage regulator
 - Schmitt trigger
- (ii) A security system is designed to sound an alarm when someone steps on a mat during the hours of darkness. The alarm is to remain on when the pressure on the mat is removed.
- Draw a block diagram to represent the system
 - Select suitable logic gates and draw the logic circuit
 - Draw a modified logic circuit to include a reset option

Option 3 - Information and Communications Technology - Answer 3(a) and 3(b)

- 3(a) (i) Give **three** examples of how you could use a computer to communicate with other people.
- (ii) You are given the task of specifying computers for the Technology room in your school. Recommend, using correct units, suitable values for **each** of the following and for each item give reasons for your recommendations:

- Hard drive capacity
- RAM
- Processor speed
- Independent graphics card



- 3(b) (i) Your school wishes to install a computer network. Outline **two** advantages of a server-based system over a peer-to-peer network system.
- (ii) Explain what is meant by a *mapped network drive* and explain how this would be of benefit in a school network system.
- (iii) Draw a block diagram of a computer network consisting of four computers, a printer and a switch.

Answer 3(c) or 3(d)

- 3(c) (i) A photograph from a student's Technology project is shown. When the photograph is zoomed, it becomes pixellated as shown. Explain why this happens. Explain how different colours are displayed.



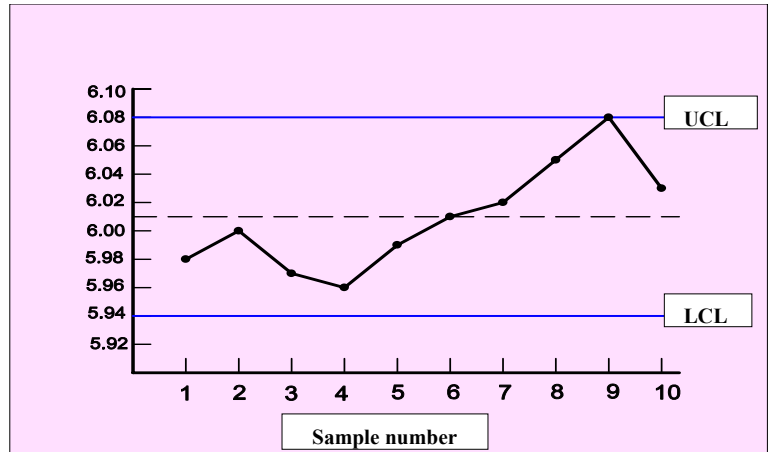
- (ii) Describe **two** image file formats and refer to the following in your answer:
compression; resolution; where each format might be most suitable.

OR

- 3(d) (i) With the aid of a clearly labelled sketch, show how sound files are represented on computers. In your answer make reference to amplitude; sampling rate and signal type.
- (ii) Identify **two** sound file formats and explain how to edit a digital video clip to add a sound track.

Option 4 - Manufacturing Systems - Answer 4(a) and 4(b)

- 4(a) (i) In the control chart shown, state what the abbreviations **UCL** and **LCL** mean and explain each term.
- (ii) Explain why Statistical Process Control (SPC) techniques are used in large volume manufacturing.

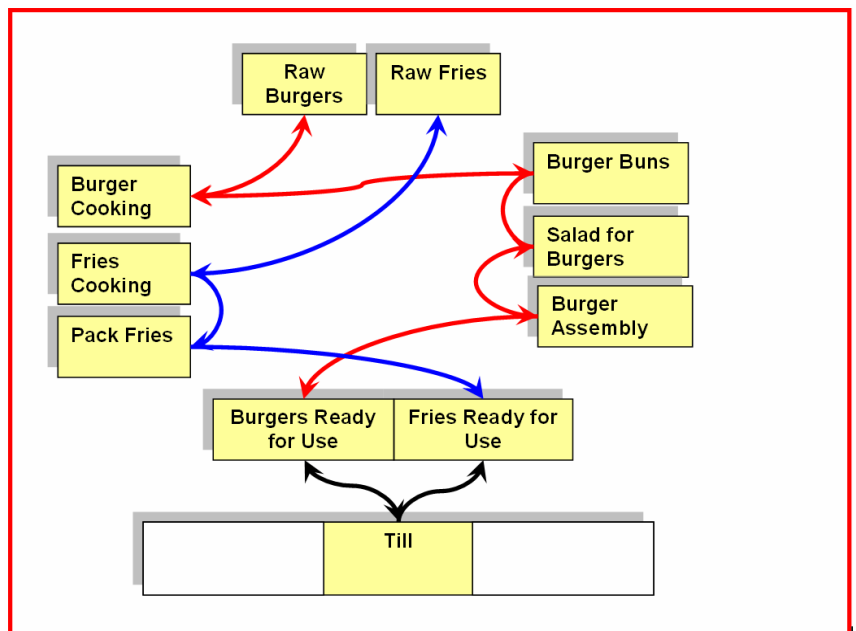


- 4(b) (i) In order to compete in the marketplace a manufacturing company needs to have a business strategy. Describe the **four** factors that make up a business strategy.

- (ii) Explain why *accelerated testing* is used on some products.
 A washing machine will be used for two hours per day, three days per week in normal use.
 What type of accelerated testing will determine the lifetime of the washing machine?
 During testing, the washing machine ran for 3000 operating hours before failing.
 Recommend a suitable guarantee period for the washing machine and give reasons for your recommendation.

- (iii) The block diagram shows the layout of the work area for a fast-food outlet. One worker makes burgers, another makes fries and a third worker serves customers.

Draw a block diagram to reorganise the work area into a cellular layout so as to minimise the amount of movement required of each worker.



Answer 4(c) **or** 4(d)

4(c) (i) The Deming Cycle is often used in quality improvement. Draw a diagram to show the **four** steps in the Deming Cycle and explain the function of each step.

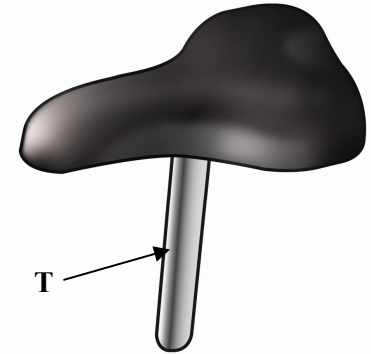
(ii) Measurement of samples from two manufacturers of the saddle tube shown at **T** yielded:

Manufacturer **A** standard deviation 0.04077

Manufacturer **B** standard deviation 0.0119

If the tube must have an outside diameter between 24.85mm and 24.95mm:

- Calculate the process capability for each manufacturer
- Which manufacturer should be chosen?
- Give **one** reason for your answer



OR

4(d) (i) Draw a simple *cause and effect* diagram to show the four main factors that can contribute to a problem and discuss briefly each factor.

(ii) The table gives data on the waiting times, in minutes per day, for customers in a restaurant.

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
Wait in minutes	7	8	10	11	10	12	12

For a mean of 10, UCL of 12 and an LCL of 7:

- Plot a suitable control chart using the data in the table above
- Is the rate of customer service in control?
- Analyse the control chart to determine if a problem is likely to occur and give reasons in support of your answer

Option 5 - Materials Technology - Answer 5(a) and 5(b)

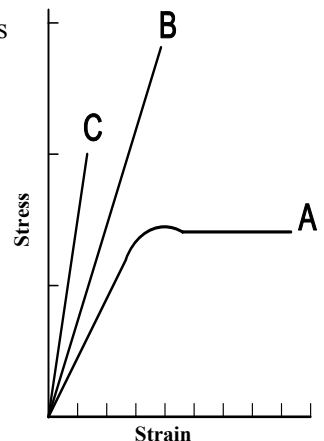
5(a) (i) Describe, with examples, the properties of **any two** of the following categories of material:

- Synthetic fabrics
- Thermoplastics
- Ceramic materials

(ii) The graph shows the outcomes of a test to determine the tensile strength of three materials:

A: PVC; B: Beech; C: Phenol formaldehyde.

Describe the properties of **each** material as outlined in the graph.



5(b)

(i) The screen of a mobile phone, as shown, was originally produced in glass, however glass proved to be an unsuitable material. Outline the reasons why glass was found to be unsuitable.

Recommend a suitable material for the screen and give two reasons for your recommendation.

(ii) Describe a suitable manufacturing process for the casing of the mobile phone. Illustrate your answer with sketches.

(iii) Discuss **two** environmental effects of the increasing use of plastics in phone technology.



Answer 5(c) or 5(d)

5(c) (i) Large batch production is commonly used to produce merchandise for the promotion of movies. Explain why this production method is used for such merchandise.

(ii) Describe in detail, with sketches, the operational principles of the following:

- Strip heater
- Electronic soldering iron

OR

5(d) (i) Outline **two** examples where a defect in a material can enhance a product and, for each example, describe how the defect enhances the product.

(ii) Explain the concept *sustainable manufacture* and discuss why it is important to consider *sustainable manufacture* at both the design and production stages of a product.

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