FORM 5 DESIGN & TECHNOLOGY TIME: 1h 45min

Name: ___________________________ Class: ____________ Set: ______

--------------------------------------
Note to student: --------------------------------------

You are required to answer all questions.

Useful formulas:

\[ T = RC \]
Resistance in series \( R_T = R_1 + R_2 + \ldots \)

--------------------------------------

FOR TEACHERS' USE ONLY DISTRIBUTION OF MARKS

<table>
<thead>
<tr>
<th>Areas corrected</th>
<th>Marks for Written Exam</th>
<th>Marks for Design Folio</th>
<th>TOTAL</th>
<th>FINAL MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>RM</td>
<td>E</td>
<td>F</td>
<td>T</td>
</tr>
<tr>
<td>Max. Marks</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Student’s mark</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION A: DESIGN

Your local council is organising a youth fest in your village. The idea of the youth fest is to promote local talent in your village. You have been asked to team up with a group of designers to design the following items.

- A trophy to be given to the winner of a song festival that is going to be held during the activity.
- A lunch to be distributed to a group of foreigners that are going to visit the village. The lunch must include at least one traditional Maltese item.
- A banner to be displayed at the village entrance.
- A small and simple electronic gadget to distribute among children.

Before answering questions 1 to 5, choose ONE product from the list above. Underline your choice.

1. Certain issues must be considered when designing the chosen product.

   a. State TWO issues that are related to how the product looks.

   __________________________________________________________
   __________________________________________________________

   b. State ONE environmental issue that must be considered.

   __________________________________________________________

   1 mark x 3 = 3 marks

2. Write FOUR specifications for the item you have chosen that are related to:

   a. Safety/hygiene ____________________________________________

   b. Time ___________________________________________________

   c. Cost ___________________________________________________

   d. Target user/s __________________________________________

   1 mark x 4 = 4 marks
3. Sketch ONE idea for your chosen product. Add notes, dimensions or portion sizes, and add colours to the sketch.

4. Which is the most suitable method of production for making your product? Give ONE reason for your answer.

   Method of production: _________________________________________________________

   Reason: ___________________________________________________________________
   ___________________________________________________________________

   3 marks
5. It is important to plan ahead before starting work on your final product. Prepare a short work plan explaining the main steps involved in making the product you sketched in question 3.

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

5 marks

SECTION B: RESISTANT MATERIALS

**Figure A** shows a plastic aquarium which a family bought for their house.

![Figure A: The main features of the aquarium](image-url)
6. The top and bottom parts are made from a thermosetting plastic and were manufactured by press-moulding.
   
a. Define the term “thermosetting plastic” and give a reason why such plastic was used for these parts.
   
   **DEFINITION:**
   
   **REASON:**
   
   \( \frac{1}{2} \text{ mark} \times 2 = 1 \text{ mark} \)
   
   b. Briefly describe what is meant by “press-moulding”.
   
   \( \quad \)

   1 mark

7. The sides, front and back parts are made from four pieces of thermoplastic sheets, forming the wall of the aquarium.
   
a. Suggest a method by which to join these four sheets.
   
   \( \quad \)

   1 mark
   
   b. Name TWO properties that the plastic of the front part should have. Give a reason for naming each property.
   
<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   3 marks
   
   c. By means of a labelled sketch, explain how the front part can be curved from a flat thermoplastic sheet.
   
   \( \quad \)

   2 marks
8. The family is going on a vacation, leaving no one to take care of the fish in their aquarium. One member of the family decided to design an automatic fish feeder to be attached to the top part of the aquarium.

**Figure B** is a sketch of one of the ideas for this attachment.

![Figure B: Initial idea for the automatic fish feeder](image)

The above idea in **Figure B** suggests that a quadrant-shaped hole is cut in the top part of the aquarium. If this hole is manually-made, mention the FOUR main steps involved to complete the hole. Write the steps in the correct sequence on the diagram below.

![Diagram of hole making steps](image)

½ mark × 4 = 2 marks

9. The idea in **Figure B** was developed further. **Figure C** shows a mechanism which makes the flap rotate clockwise and anti-clockwise so that the food flakes fall into the aquarium through the hole in the top.

![Figure C: The two states of the feeder mechanism](image)
The central pulley is connected to a motor which rotates clockwise and anti-clockwise until the flap touches the limit switches.

a. State what is the input and output of this mechanical system.

**INPUT:**

**OUTPUT:**

1 mark × 2 = 2 marks

b. State the direction of rotation of the central pulley when:
   i. the flap is moving from closed to open position:

ii. the flap is moving for open to closed position:

1 mark × 2 = 2 marks

10. The mechanical system shown in **Figure C** was built and tested.

a. It was noted that the speed of the motor was too fast for the feeder to function properly. Therefore, the motor shaft was separated from the central pulley shaft to make space for a speed-reduction mechanism. In the space provided, complete the diagram by drawing the appropriate mechanism to solve this problem.

   ![Diagram of mechnical system](image)

   3 marks

b. When the feeder mechanism was in open position, the connecting cable was in the way of the food flakes. After a number of tests, the pulley system clogged because the cable became dirty. Suggest ONE modification in the food feeder to avoid this clogging.

3 marks
**SECTION C: ELECTRONICS**

**Figure D** shows an incomplete diagram explaining the electronic system used for the automatic fish feeder discussed in the previous section. The flap of the feeder rotates only when there is daylight and an NE555 timer is on.

![Diagram](image)

Figure D

11. State the name of the diagram shown in Figure D.

12. Use the following terms to answer question 12a and 12b below.

| Light sensor | Darlington Pair transistor | Motor |

a. Complete the diagram shown in Figure D by putting the above terms in the correct box.

b. Fill in the table below by classifying each term in the proper stage of the system. *(THREE examples are given)*

<table>
<thead>
<tr>
<th>INPUT</th>
<th>PROCESS</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE555 timer</td>
<td>Logic Control</td>
<td>Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

½ mark × 6 = 3 marks

13. **Figure E** shows three logic gate symbols. Choose the logic gate that should be used in the fish feeder logic control circuit. Draw its symbol and state its name in the table below.

![Logic Gates](image)

**Figure E**

Name:

½ mark × 2 = 1 mark
14. Figure F shows the output waveform generated from the NE555 timer.

**Figure F**

![Waveform Diagram](image)

a. What do we call the output waveform shown in Figure F?

________________________________________________________

1 mark

b. On Figure F, label the mark and space.

½ mark × 2 = 1 mark

c. Figure G shows the electronic circuit used to generate a timing control for the NE555. Calculate the time generated if R1 has a value of 10KΩ and C1 has a value of 100µF.

____________________________________________

____________________________________________

____________________________________________

2 marks

![Circuit Diagram](image)

d. It was decided to have a variable control for the timing circuit used. Complete the electronic circuit in Figure H to show how a 1MΩ variable resistor should be connected in order to have a variable time control.

1 mark

e. Calculate the maximum possible time produced by the new circuit.

____________________________________________

____________________________________________

____________________________________________

3 marks

![Circuit Diagram](image)
15. **Figure I** shows the physical appearance of a lever type micro switch and its electronic symbol. The micro switch is a non-latched type switch.

a. In brief, define a non-latched type switch.

```
1 mark
```

b. On the electronic symbol shown in **Figure I**, label the normally open (NO) and normally closed (NC) leg of the switch.

```
½ mark × 2 = 1 mark
```

16. **Figure J** shows the electronic circuit used to control the mechanism of the fish feeder.

```
Figure J
```

a. Study the above circuit well and state whether the following statements are true or false by ticking the appropriate column.

<table>
<thead>
<tr>
<th>Statement</th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>A relay is an electro mechanical type switch.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The relay is a SPDT type.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The motor always turns in one direction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is only ONE power supply in the circuit.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

```
½ mark × 4 = 2 marks
```
b. On the circuit diagram shown in Figure J, show how a diode is connected to protect the Darlington pair transistors from being damaged by back EMF.

1 mark

c. The company producing the automatic fish feeder wants to add an LED to indicate when the relay coil is turned ON. On the same circuit diagram shown in Figure J, show how an LED and a resistor are used to develop this idea.

2 marks

SECTION D: FOOD

Sealed tenders will be received at ‘Laduxxi Primary School’ for the supply of healthy meals. The students at the school are between the ages of 11 and 16. The meals will be eaten at noon in the school. The meals have to be individually packed and labelled.

17. Name TWO purposes that food packaging has to achieve.

________________________________________________________________________________
________________________________________________________________________________

1 mark × 2 = 2 marks

18. List THREE pieces of information which must appear on a food label.

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

1 mark × 3 = 3 marks

19. Give ONE reason why information on labels is necessary.

________________________________________________________________________________

1 mark

20. This symbol is found on packaging.
What does this symbol mean?

________________________________________________________________________________

1 mark

21. One of the foods offered is Potato scones. The ingredients used to make these scones are listed below. Rewrite the ingredients in the proper sequence as they should appear on the food label.

<table>
<thead>
<tr>
<th>Ingredients for 20 Potato Scones</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 ml olive oil</td>
</tr>
<tr>
<td>450g potatoes</td>
</tr>
<tr>
<td>30 ml chives</td>
</tr>
<tr>
<td>115g plain flour</td>
</tr>
</tbody>
</table>

1 mark × 4 = 4 marks
22. The following table shows the Nutrition information for each scone. Which one of these does not give us energy?

<table>
<thead>
<tr>
<th>Nutrition</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>50 kcal</td>
</tr>
<tr>
<td>Protein</td>
<td>1.5g</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>6.5g</td>
</tr>
<tr>
<td>Fibre (NSP)</td>
<td>0.5g</td>
</tr>
<tr>
<td>Fat</td>
<td>2.0g</td>
</tr>
</tbody>
</table>

1 mark

23. Tuna was offered with potato scones. This was cooked using a dry heat method.

a. Suggest ONE healthy dry heat cooking method suitable for cooking tuna.

__________________________________________________________

1 mark

b. Which is the main nutrient in tuna?

__________________________________________________________

1 mark

c. Tuna is low in saturate fat. Explain what saturate fat is.

__________________________________________________________

2 marks

24. A small group of children in the school are vegans.

a. What is a vegan?

__________________________________________________________

2 marks

b. Give TWO food sources from which vegans obtain their proteins?

__________________________________________________________

½ mark \( \times 2 = 1 \) mark

c. Give TWO reasons why people choose to follow a vegan diet.

__________________________________________________________

__________________________________________________________

½ mark \( \times 2 = 1 \) mark

<table>
<thead>
<tr>
<th>Method</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 mark × 2 = 2 marks

26. Complete the table to show the names and uses of some frequently used equipment in the textile technology lab.

<table>
<thead>
<tr>
<th>Picture</th>
<th>Name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Sewing Machine" /></td>
<td>Sewing Machine</td>
<td>To sew on fabrics</td>
</tr>
<tr>
<td><img src="image" alt="Iron" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Needle" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Thread" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Ruler" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Scissors" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

½ mark × 10 = 5 marks

27. Cotton Poplin is a very popular fabric used for school P.E. kits. Give TWO properties that make this fabric suitable for these kits and give one reason for each property.

<table>
<thead>
<tr>
<th>Properties</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

½ mark × 4 = 2 marks
28. Give ONE reason why cotton fibres are used for the manufacturing of denim to produce jeans wear.

__________________________________________________________________________

1 mark

29. Fastenings on a product are important. Look at the products below.

![Shirt and Jeans](image)

a. Name the fastenings used on both products.

__________________________________________________________________________

2 marks

b. Name ONE different fastening that could be used instead of those stated above.

__________________________________________________________________________

2 marks

30. Name TWO different methods of colouring 100% cotton fabrics.

__________________________________________________________________________

1 mark × 2 = 2 marks

31. Name TWO non-woven fabrics which may be used in textiles products manufacture.

__________________________________________________________________________

1 mark × 2 = 2 marks

32. Give TWO reasons why Elastane and Lycra are used in the production of swimwear.

__________________________________________________________________________

__________________________________________________________________________

1 mark × 2 = 2 marks