**TONGA FORM SIX CERTIFICATE**

**2014**

**DESIGN TECHNOLOGY**

**QUESTION AND ANSWER BOOKLET**

**Time allowed**: 2 ½ Hours

**INSTRUCTIONS**

1. Answer ALL questions.
2. This examination has **TWO** Sections. Each section is worth 50 marks.

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DESIGN UNDERSTANDING</td>
<td>Compulsory. Answer ALL questions.</td>
</tr>
<tr>
<td>B</td>
<td>MAJOR OUTCOMES</td>
<td>Choose ONE (Major 1 – Major 6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major</th>
<th>Topic</th>
<th>Questions</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wood Technology</td>
<td>B1-B4</td>
<td>8-17</td>
</tr>
<tr>
<td>2</td>
<td>Metal Technology</td>
<td>B5-B9</td>
<td>18-29</td>
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<tr>
<td>3</td>
<td>Food and Nutrition</td>
<td>B10-B12</td>
<td>30-35</td>
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<tr>
<td>4</td>
<td>Textiles and Garment Construction</td>
<td>B13-B15</td>
<td>36-40</td>
</tr>
<tr>
<td>5</td>
<td>Technical Graphics</td>
<td>B16-B19</td>
<td>41-51</td>
</tr>
</tbody>
</table>

3. Select only ONE major and answer all the questions in that major.
4. Write your answers in the spaces provided in this booklet.
5. Write your **Student Personal Identification Number (SPIN)** in the box at the top right hand corner of this page and on the last page of this booklet.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR BEFORE YOU LEAVE THE EXAMINATION ROOM.

**TOTAL MARKS**

100
SECTION A: DESIGN UNDERSTANDING  (50 marks)

Answer ALL questions in this section.

Question 1 Multiple Choices (10 marks)

Circle the letter of the BEST answer.

1. One of the most important questions to be considered while evaluating the end product:
   
   A. Does it work well?
   B. Does it give money?
   C. Does it look beautiful?
   D. Does it use local materials?

2. In a design brief for a product, system or environment, what is the main purpose of the design specifications provided by a client to a designer?
   
   A. They summarise all features used in the design.
   B. They outline aspects of the design in order to meet specific needs.
   C. They examine market trends, legal requirements and budget figures.
   D. They list important social and environmental considerations in the design.

3. Successful completion of a major design project depends on a student making the correct link between
   
   A. action and time management.
   B. sustainability and appropriateness of materials.
   C. experimentation and development of practical skills.
   D. generation of concept designs and organising materials.

4. A designer has been asked to design a new hot-drink dispensing system and identify suitable materials for the cups. What is the best course of action for evaluating the most suitable materials for these cups?
   
   A. Make a working model and test the operation of the system.
   B. Invite a focus group to evaluate the range of materials that have been selected.
   C. Investigate the properties of possible materials and trial them in similar situations.
   D. Seek expert advice on the range of materials available and use those that have been recommended.
5 When is a design solution considered to be most appropriate?
A. When it satisfies the aesthetic requirements
B. When it meets the needs of the target market
C. When it provides strength, durability and safety
D. When it fulfils its intended end-use requirements

6 Key points to address before production are ________________.
A. strive for excellence
B. build and test prototype
C. repair tasks and evaluate
D. implement and document

7 Which of the following is the most important technique to consider by designers when selecting a technique to demonstrate a client’s design brief?
A. Making ideas persuasive for the intended audience
B. Cost of the presentation and prototype development
C. Making ideas easily understood by the intended audience
D. Creating an ‘eye-catching’ presentation for the intended audience

8 A designing folio is a ________________________.
A. collection of information
B. document for marking a product
C. designing report used only by examiners
D. designing report of how a product is to be processed

9 A delay in completing a design project is most likely to be caused by ________.
A. poor timing
B. poor planning
C. lack of finance
D. lack of resources

10 Why is it necessary to evaluate a product’s features and/or functions?
A. To ensure that the greatest number of the product will sell.
B. To determine whether the product is aesthetically pleasing.
C. To ensure that the product performs all of its desired operations.
D. To determine whether the product is a quality solution to the design problem.
## Question 2: Definition (10 marks)

Define the following terms.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Technology</td>
<td></td>
</tr>
<tr>
<td>ii. Skill</td>
<td></td>
</tr>
<tr>
<td>iii. Limitation</td>
<td></td>
</tr>
<tr>
<td>iv. Designing</td>
<td></td>
</tr>
<tr>
<td>v. Innovation</td>
<td></td>
</tr>
</tbody>
</table>
Question 3  
(10 marks)

1. Explain how you carried out your Investigations during the process of designing your Independent Project this year.

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

(5 marks)

2. Explain the meaning of managing resources as used in the Producing stage.

____________________________________________________________________________
____________________________________________________________________________

(2 marks)

3. Explain why it is important to use a range of specifications in the development of a design solution.

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

(2 marks)

4. Explain why it is important to have clear information about a product in the design specification.

____________________________________________________________________________

(1 mark)
Question 4 (10 marks)

The boxes below illustrate the Design Process. Study the contents of the boxes and answer the questions that follow.

**MAKING**

1. Produce the solution that can involve any ‘making’ activity e.g:
   - Build and test a prototype
   - Implement a decision
   - __________________________
   - __________________________
   - __________________________

**DESIGNING**

1. Clarify the problem
   - __________________________
   - __________________________
   - Investigate ideas for solutions
   - Identify the most likely idea
   - Develop and refine the idea
   - Model or trial the proposal
   - Evaluation and document

**EVALUATING**

1. Think about the outcome
   - Does it meet the design brief?
   - How well does it work?
   - Could it be improved?
   - What remain to be done?
   - Document and prepare report

a. Complete the remaining bullet points in the ‘Designing’ and ‘Making’ boxes. (5 marks)
b. Using arrows, show how the boxes relate to each other. (1½ marks)
c. Explain what is meant by the Design Process being a ‘Two-way process’

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

(3½ marks)
Question 5  

(6 marks)

The flower-shaped egg rings were evaluated by a range of end users before going into commercial production. Identify TWO methods of evaluating products and explain the advantages of these methods.

Method of evaluating products 1. ______________________________________________
Advantages_______________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
Method of evaluating products 2. ______________________________________________
Advantages_______________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

(6 marks)

Question 6  

(4 marks)

Name TWO characteristics of materials used in your independent project and explain HOW appropriate they were to the client’s need.

Characteristic 1:
___________________________________________________________________________(1mark)

Characteristic 2:
___________________________________________________________________________(1mark)

Explain:
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

(2marks)
MAJOR 1: WOOD TECHNOLOGY (50 MARKS)

QUESTION B1. (10 marks)

1. Complete the table below by stating the following:
   - TWO methods of seasoning timber
   - ONE advantage and
   - ONE disadvantage of each method.

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>1.</td>
<td>1.</td>
</tr>
<tr>
<td>ii)</td>
<td>1.</td>
<td>1.</td>
</tr>
</tbody>
</table>

(2 marks)

2. Name ONE main cause of the following timber defects.

<table>
<thead>
<tr>
<th>Timber Defects</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Warps</td>
<td></td>
</tr>
<tr>
<td>ii) Knot</td>
<td></td>
</tr>
<tr>
<td>iii) Shakes</td>
<td></td>
</tr>
<tr>
<td>iv) Checks</td>
<td></td>
</tr>
</tbody>
</table>

(4 marks)

3. Name and describe a method used to determine the timber’s moisture content.
   a. Method’s Name: ________________________________

   Description:

   ________________________________

(2 marks)
b. Calculate the percentage of moisture content from the given information:
   Wet weight of sample piece = 150 grams
   Dry weight of sample piece = 130 grams
(Show all necessary workings)

QUESTION B2.  

1. Study the study table below and answer the following questions

a) Complete the cutting list below to show the net sizes of all timber needed for the study table (that is allow no waste)

<table>
<thead>
<tr>
<th>Part</th>
<th>No. of Pieces</th>
<th>Total Length</th>
<th>Width</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Legs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>Rail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>Top</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(3 marks)
b) Calculate the cost of the timber for the table.

<table>
<thead>
<tr>
<th>Prices</th>
<th>Calculations</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Timber for legs is $6.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>per metre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Timber for rails is $4.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>per metre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Material for the top is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$23.00 per square metre</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{\textit{TOTAL COST}} = \phantom{123456789} \]

(3 marks)

c) Name a suitable joining technique that can be used to join the leg and the rail of the study table in part a).

\[ \phantom{123456789} \]

(1 mark)
d) Give ONE reason for your choice.

\[ \phantom{123456789} \]

(1 mark)
e) Sketch and label the join detail you name in part c).

LEG AND RAIL

(2 marks)
The table rails have been lightened in weight and appearance by shaping the lower edge.

f) List the STEPS and hand TOOLS you would use to set out, cut, and clean up the shape. (Use sketches where necessary.)

<table>
<thead>
<tr>
<th></th>
<th>Steps</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(3 marks)

After a project is made the bare timber needs to be given some type of finishing.

g) Give TWO reasons why a timber finish needs to be applied for the study table in part a).

i) _____________________________________________________________________________

ii) _____________________________________________________________________________

(1 mark)

b) Give TWO factors that decide the type of finishing used for the study table in part a).

i) _____________________________________________________________________________

ii) _____________________________________________________________________________

(1 mark)
QUESTION B3:  

Study the student’s study desk given below and answer the following questions.

a. The study desk legs need to be turned from a 100 mm x 100 mm x 800 mm timber to the required shape.

i) Describe in point form how to prepare the 100 mm x 100 mm x 800 mm timber before put on the wood lathe machine for turning.
ii) Complete the table below by naming 2 cutting tools and 2 measuring tools that could be used for turning the study desk legs to the required shape.

<table>
<thead>
<tr>
<th>CUTTING TOOLS</th>
<th>i)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ii)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MEASURING TOOLS</th>
<th>i)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ii)</td>
<td></td>
</tr>
</tbody>
</table>

(2 marks)

b. Name FOUR (4) safety rules that must be observed when working on the wood lathe machine.

i) ______________________________________________________________________

ii) ______________________________________________________________________

iii) ______________________________________________________________________

(2 marks)

c. Study the draw of the study desk given and answer the following questions.
i) Complete table below with the appropriate joint for the drawer parts and also the reason to support your choice.

<table>
<thead>
<tr>
<th>JOINT PARTS</th>
<th>TYPE OF JOINT</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front to 2 Sides</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1 mark)

ii) Sketch an isometric view of the joint you choose in the space provided.

FRONT TO SIDE

(2 marks)
QUESTION B4:  

(16 marks)

1. Hand Tools

   a. Complete the table below with the right application of each plane.

<table>
<thead>
<tr>
<th>Plane</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Smoothing Plane</td>
<td></td>
</tr>
<tr>
<td>ii) Router Plane</td>
<td></td>
</tr>
<tr>
<td>iii) Jack Place</td>
<td></td>
</tr>
</tbody>
</table>

   (3 marks)

   b. Complete the following statement

      i. A hacksaw with a “Chisel Like” cutting action is a ___________________ saw.
      
      ii. A similar sized saw with a “knife Like” cutting action is a _____________ saw.

   (1 mark)

   c. The drawing shows a badly gapped chisel. In logical order list the steps you would take to restore the chisel to good condition. (Include sketches where appropriate)

<table>
<thead>
<tr>
<th>In this column, list possible STEPS you would take</th>
<th>In this column, any SKETCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td></td>
</tr>
<tr>
<td>ii.</td>
<td></td>
</tr>
<tr>
<td>iii.</td>
<td></td>
</tr>
<tr>
<td>iv.</td>
<td></td>
</tr>
<tr>
<td>v.</td>
<td></td>
</tr>
<tr>
<td>vi.</td>
<td></td>
</tr>
</tbody>
</table>

   (3 marks)
d. Choose the hand tool that is best used to complete each of the jobs listed in the table below.

<table>
<thead>
<tr>
<th>Job</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) The final sharpening (honing) of a chisel.</td>
<td></td>
</tr>
<tr>
<td>ii) For sawing along the grain.</td>
<td></td>
</tr>
<tr>
<td>iii) A small hand saw used for cutting curved shaped letters in 4 mm plywood.</td>
<td></td>
</tr>
<tr>
<td>iv) Checking an edge for square.</td>
<td></td>
</tr>
<tr>
<td>v) Making a chamfer on the end grain of a table top.</td>
<td></td>
</tr>
<tr>
<td>vi) Holding together two boards while the glue dries.</td>
<td></td>
</tr>
</tbody>
</table>

(3 marks)

2. **FINISHING**

Paint is the most commonly used alternative to timber finish.

a. Name the TWO (2) basic types of paint available.

   i) ____________________________________________________________________

   ii) ____________________________________________________________________

   (1 mark)

b. Name the THREE (3) coats of paint usually applied to timber.

   i) ____________________________________________________________________

   ii) ____________________________________________________________________

   iii) ____________________________________________________________________

   (1 mark)
c. A list of items requiring a timber finish are listed in the table below. Complete the table below with the type of suitable timber finish and the reason for your choice.

<table>
<thead>
<tr>
<th>Type of Finish</th>
<th>Reason for Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Wooden Fence</td>
<td></td>
</tr>
<tr>
<td>ii. Piano Stool</td>
<td></td>
</tr>
<tr>
<td>iii. Toy Truck</td>
<td></td>
</tr>
<tr>
<td>iv. Coffee Table</td>
<td></td>
</tr>
</tbody>
</table>

(4 marks)
1. MACHINE SAFETY

a. A Bench Grinder with various safety factors is shown. Briefly explain how the named parts act as a safety feature. An example is given.

i) **Eye Shields**
   *Eye shield protect the eyes from sparks*

ii) ON/OFF switch ______________________________________________________________________

iii) Side Plate _____________________________________________

iv) Adjustable Tongue Guard _____________________________________________

v) Adjustable Tool Rest _____________________________________________

   ______________________________________________________________________

   (2 marks)

b. The grinding wheel of the bench grinder has to be dressed. Give TWO reasons why this should be necessary.

   i. ______________________________________________________________________

   ii. ______________________________________________________________________

   (1 mark)
2. **MATERIAL SCIENCE**

a. Briefly explain the following heat treatment processes:

<table>
<thead>
<tr>
<th>Heat Treatment Processes</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Quenching</td>
<td></td>
</tr>
<tr>
<td>2 Annealing</td>
<td></td>
</tr>
<tr>
<td>3 Tempering</td>
<td></td>
</tr>
</tbody>
</table>

(3 marks)

b. Briefly explain with example the difference between Ferrous and Non-ferrous metal.

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

(1 mark)

**QUESTION B6** (18 marks)

1. **HAND TOOLS**

a. **Twist Drills**

State TWO factors that should be considered in selecting the cutting speed for drilling a hole with a high speed steel (HSS) twist drill.

**Factor1:**
____________________________________________________________________________
____________________________________________________________________________

**Factor2:**
____________________________________________________________________________
____________________________________________________________________________

(2 marks)
b. **Hacksaw**

i. A notice on a power saw machine reads “DO NOT USE METAL LESS THAN 10 mm DIAMETER” Give a reason for this rule.

______________________________________________________________________
______________________________________________________________________

(1 mark)

ii. What is ‘**TPI 18**’ that is normally written on the hacksaw blade.

______________________________________________________________________

(1 mark)

c. Give **either** the correct full name of each of the following tools OR make a sketch of each of them.

i. Tool use for dressing the grinding wheel.

______________________________________________________________________

(1 mark)

ii. Tool used for making the internal drilled surface smooth.

______________________________________________________________________

(1 mark)

d. **Files**

i. State the particular feature of the hand file.

______________________________________________________________________

(1 mark)

ii. Files are classified by 4 things, name any TWO (2).

1. __________________________________
2. __________________________________

(2 marks)

iii. Files cannot be sharpening. The life of files depends on how you look after it. Briefly explain how you store files properly.

______________________________________________________________________
______________________________________________________________________

(2 marks)
e. **Threads and Screw cutting**

a. **Drilling Tapping Hole**

An approximate formula for finding the size of the tapping drill is (Outside Diameter – Pitch). The drill required for the 16 mm Tap with 2.00 P would be _______________ mm. (1 mark)

b. **Tapping**

The sketch of the taper tap used in the making of the nut is shown.

![Sketch of taper tap](image)

i. Show clearly on the sketch how the markings 16 and 2.00P refer to the outside diameter and the pitch. (1 mark)

ii. What angle is the thread at A? _______________ (1 mark)

iii. Explain how the taper tap differs from the second or intermediate tap.

________________________________________________________________
________________________________________________________________

(1 mark)

iv. Give TWO (2) important points to observe when tapping or threading the nut.

1. _________________________________________________________________
   _________________________________________________________________

2. _________________________________________________________________
   _________________________________________________________________

(1 mark)
f. **Outside Micrometre**

i. Name the corresponding numbered parts of the micrometre in the table shown below. An example is provided.

<table>
<thead>
<tr>
<th>Number</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Barrel</td>
</tr>
<tr>
<td>3</td>
<td>Thimble</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

(2 marks)

ii. What will be the new measurement between numbered part 6 and numbered part 5?
   Answer: ______ mm  

(1 mark)

iii. The reading on the enlarged sketch of the thimble and the barrel above is ______ mm.

(1 mark)
**QUESTION B7:** (8 marks)

**Project Construction**
A mild steel door gong shown in the photograph and the bracket shown in the drawing is to be made as a workshop project.

Read the job sequence showing what operations, tools, and procedure are required to make the BRACKET.

<table>
<thead>
<tr>
<th>STEPS</th>
<th>Operation</th>
<th>Hand or Machine Tool</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Cut from stock</td>
<td>Rule, Hacksaw</td>
<td>Hold in vice, cut to length.</td>
</tr>
<tr>
<td>(2)</td>
<td>Form Ends</td>
<td>Heat source, Hammer, Anvil</td>
<td>Bring to red heat. Flatten end using hammer and anvil. Use the beak to obtain curve.</td>
</tr>
<tr>
<td>(3)</td>
<td>Mark out hole positions and drill</td>
<td>Rule, scriber, square, odd leg callipers, centre punch, hammer, twist drill, drilling machine.</td>
<td>Drill Ø5 hole</td>
</tr>
<tr>
<td>(4)</td>
<td>Bend at 90°</td>
<td>Heat source, vice</td>
<td>Red heat, clamp in vice, and bend.</td>
</tr>
</tbody>
</table>
a. **Operation 1**
   Explain why you should use a hand hacksaw rather than power saw.

   (1 mark)

b. **Operation 2**
   i. Name the suitable source of heat used in operation 2.

   (1 mark)

   ii. Explain why the striking face or pein end of the hammer should be used to form the end of the Hanging Bracket.

   (1 mark)

   iii. Name the part of the anvil that should be used to forming the curves at the end of the Hanging Bracket.

   (1 mark)

c. **Operation 3**
   i. Explain by means of a sketch in the box provided how odd leg callipers are used in operation 3.

   (1 mark)
ii. Before you drill the holes in operation 3, what should you do to prevent the drill from wandering?

______________________________________________________________

(1 mark)

iii. State the purpose of the holes drilled in the Hanging Bracket.

______________________________________________________________

(1 mark)

d. **Operation 4**

i. The procedure for operation 4 directed the following: “Red heat, clamp in vice, and bend”. Explain why is NOT advisable to clamp the Hanging Bracket in a vice before heating.

______________________________________________________________

(1 mark)

**QUESTION B8**

(11 marks)

a. **Sheet Metal Working**

The sketch shows a pictorial view of a small Tool Box which is to be fitted to the boot of a car. The tool box is to be made out of galvanised flat steel.
i. Shown below is the part development (back and bottom) of the tool box. Complete this development and show all the necessary flaps for making the lap joints prior to soldering.

BE CAREFUL TO THINK ABOUT THE SHAPE SHOWN ABOVE

BACK

BOTTOM

(2 marks)

b. Soft Soldering

Because all necessary equipment is available it is decided to soft solder the joints of the tool box

i. The soft solder used is 50/50. Briefly explain what 50/50 soft solder means.

(1 mark)
ii. When a soldered joint is to be made as strong as possible the laps are "tinned" first. Explain step by step how the tinning process is carried out.

Step1. ____________________________________________________________

Step2. ____________________________________________________________

Step3. ____________________________________________________________

(1 mark)

c. **Oxy-Acetylene Welding**

i. The oxy-acetylene equipment in most schools is fitted with flash-back arrestors. Explain their purpose.

____________________________________________________________________

____________________________________________________________________

(1 mark)

ii. Name the correct tool used to clean a blocked welding torch tip.

____________________________________________________________________

(1 mark)

iii. A partly blocked welding torch may occasionally ‘pop’ or backfires. Name TWO (2) other causes of ‘popping’ or ‘back firing’.

1. ________________________________________________________________

2. ________________________________________________________________

(1 mark)
d. **Electric Welding**

a. Briefly explain why oxy-acetylene welding goggles are not adequate protection for electric welding.

b. “Suitable safety clothing must be worn when welding” Apart from a face mask, give TWO other items of safety wear that would be necessary.

1. __________________________________________________________

2. __________________________________________________________

**QUESTION B9:**

e. **Metal Turning Processes**

A pictorial sketch of model cannon is shown below. Four wheels are to be made to the sizes given.
i. Fill in the gaps of how the four wheels would be made from **ONE** setting in the lathe.
Material: 150 mm long × 32 mm diameters free cutting mild steel.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Setting-up</td>
<td>Hold steel in a 3 jaw chuck approximately half way along its length.</td>
</tr>
<tr>
<td>2. Facing</td>
<td>i) ___________________________________________________________________</td>
</tr>
<tr>
<td></td>
<td>ii) ___________________________________________________________________</td>
</tr>
<tr>
<td>3. ____________</td>
<td>Use a right-hand tool in tool holder and machine the outside diameter to 30 mm for a length of 60 – 70 mm.</td>
</tr>
<tr>
<td>4. Drilling</td>
<td>i) ___________________________________________________________________</td>
</tr>
<tr>
<td></td>
<td>ii) ___________________________________________________________________</td>
</tr>
<tr>
<td>5. Parting Off</td>
<td>i) Set parting tool up square and on centre.</td>
</tr>
<tr>
<td></td>
<td>ii) Using cutting fluid and a slow speed cut wheel off 10 mm wide.</td>
</tr>
<tr>
<td></td>
<td>iii) Give parting tool side clearance</td>
</tr>
</tbody>
</table>

ii. What alternative to the 3 jaw chuck could be used for holding the round bar in step 1 (Setting up)

____________________________________________________________________________________ (1 mark)

iii. Refer to step 5 (Parting off).
1. What is the side clearance?
   ___________________________________________________________________________________ (1 mark)

2. Why is it necessary?
   ___________________________________________________________________________________ (1 mark)
**MAJOR 3 FOOD AND NUTRITION (50 MARKS)**

Answer ALL questions in this section.

**Question B10**

Define the following terms: (10 marks)

<table>
<thead>
<tr>
<th></th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Nutritional value</td>
</tr>
<tr>
<td></td>
<td>________________________________</td>
</tr>
<tr>
<td></td>
<td>(1 mark)</td>
</tr>
<tr>
<td>2.</td>
<td>Digestion</td>
</tr>
<tr>
<td></td>
<td>________________________________</td>
</tr>
<tr>
<td></td>
<td>(1 mark)</td>
</tr>
<tr>
<td>3.</td>
<td>Sauté</td>
</tr>
<tr>
<td></td>
<td>________________________________</td>
</tr>
<tr>
<td></td>
<td>(1 mark)</td>
</tr>
<tr>
<td>4.</td>
<td>Absorption</td>
</tr>
<tr>
<td></td>
<td>________________________________</td>
</tr>
<tr>
<td></td>
<td>(1 mark)</td>
</tr>
<tr>
<td>5.</td>
<td>Preserving</td>
</tr>
<tr>
<td></td>
<td>________________________________</td>
</tr>
<tr>
<td></td>
<td>(1 mark)</td>
</tr>
</tbody>
</table>
6. High-risk food

7. Temperature Danger Zone

8. Contamination

9. Thawing

10. Toxic

(1 mark)
Question B11

Short Answers

(20 marks)

Answer ALL questions.

1. The “Kau Mai Netball” Project is an effort to cut down on overweight and obese in our country and generally encourage good health. Design a menu/diet that might help with the success of the project. Answer the following questions accordingly.

a. Design a menu/diet that might help with the success of the project.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

(2 marks)

b. List 4 food / dishes you use and explain why you use them in your menu.

i) Dish: ___________________________________________________________________
   Reason: __________________________________________________________________

ii) Dish: ___________________________________________________________________
    Reason: __________________________________________________________________

iii) Dish: ___________________________________________________________________
    Reason: __________________________________________________________________

iv) Dish: ___________________________________________________________________
    Reason: __________________________________________________________________

(4 marks)

c. Pick ONE (1) of the dishes above. Write a complete recipe for the dish.

Dish Title: ______________________

Ingredients: ______________________   ______________________   ______________________
             ______________________   ______________________   ______________________

(2 marks)
d. Methods of cooking in order:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

(4 marks)

Draw a healthy dietary guideline and write each of your food ingredients into the guideline.

(8 marks)
Question B12  Long Answers  (20 marks)

Answer ALL questions.

1. Choose ONE of the given topics and answer it.

   a. Food quality can be affected intentionally or unintentionally, elaborate on how this can happen referring to at least **3 different methods/ways** of changing food quality.

   b. Discuss the importance of **safe food preparation** making references to and giving examples of personal hygiene, kitchen hygiene and food hygiene.

   **Topic:**

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________
2. This year you had a problem to solve. Use the information from your Independent Project to answer the following questions.

a. Write down THREE (3) of the specifications you were given.

_________________________________________________________

_________________________________________________________

_________________________________________________________  (1½ marks)

b. Give the THREE (3) alternative solutions you established.

_________________________________________________________

_________________________________________________________

_________________________________________________________  (1½ marks)

c. Which of the above alternative solutions did you choose? Discuss why you choose that solution instead of the other TWO.

_________________________________________________________

_________________________________________________________

_________________________________________________________  (3 marks)

d. List TWO (2) safety precautions you used when you were preparing your dish (es) and explain why they were important during your food preparation.

_________________________________________________________

_________________________________________________________

_________________________________________________________  (2 marks)

e. If you were to redo your research, what other information would you try to find, in trying to improve your solution?

_________________________________________________________

_________________________________________________________

_________________________________________________________  (2 marks)
MAJOR 4: GARMENT CONSTRUCTION & TEXTILES (50 MARKS)

Answer ALL questions in this section.

QUESTION B13 DEFINITION (10 marks)

Define the following terms

1. Snipping
   ________________________________________________________________
   (2 marks)

2. Tracing
   ________________________________________________________________
   (2 marks)

3. Finishing
   ________________________________________________________________
   (2 marks)

4. Tacking
   ________________________________________________________________
   (2 marks)

5. Slit
   ________________________________________________________________
   (2 marks)
QUESTION B14

SHORT ANSWERS

(20 marks)

a. Match Column B Functions to Column A Parts of the sewing machine.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Sewing Machine Parts</th>
<th>Column B</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Presser foot</td>
<td></td>
<td>A.</td>
<td>Moves the fabric under the pressure foot.</td>
</tr>
<tr>
<td>2. Take up lever</td>
<td></td>
<td>B.</td>
<td>Covers the area around the needle</td>
</tr>
<tr>
<td>3. Throat plate</td>
<td></td>
<td>C.</td>
<td>Holds the thread that appears on the underneath side of the fabric</td>
</tr>
<tr>
<td>4. Bobbin</td>
<td></td>
<td>D.</td>
<td>Pulls the thread from the spool and through the tension regulator</td>
</tr>
<tr>
<td>5. Feed dog</td>
<td></td>
<td>E.</td>
<td>Holds the fabric in place as the machine stitches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F.</td>
<td>Adjusts the amount of pressure applied to the pressure foot, and in turn, to the fabric.</td>
</tr>
</tbody>
</table>

(5 marks)

b. (i) Explain why you use the following techniques during garment construction.

Trimming:___________________________________________________

(2 marks)

Grading:_______________________________________________________

(2 marks)

(ii) Where in the garment do you applied those techniques?

______________________________________________________________________

(1 mark)

c. Identify where in the garment do you applied the following techniques?

i. Stay stitching ________________________________________________

ii. Seam Allowance______________________________________________

iii. Understitching______________________________________________

iv. Interfacing__________________________________________________

v. Topstitching__________________________________________________

(5 marks)
d. Explain why you press as you sew the garment.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

(2 marks)

e. Give ONE method used to transfer pattern symbols on to fabric. Explain why you use that method.

**Method:**

______________________________________________________________________________

**Reason:**

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

(3 marks)
QUESTION B15  
LONG ANSWERS  
(20marks)

Use your Independent Project this year to answer the following questions.

1. Analyse the Success of the Design Process as you used it for designing your project this year. Use the following statements as guidelines to your evaluation.

   a. Clearly point out at which point of the Process did you start your work, and explain how the Design Process helped guide you at this stage to begin your work.

   b. When researching, you had 3 alternative solutions. Sketch these solutions and explain why you chose the final solution over the other two suggestions.

   (4marks)

   (4marks)
c. Discuss the usefulness of the Design Process as a two-way-process in producing and reproducing a successful final solution. You may use drawings for elaboration.

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

(6 marks)

d. How many times did you evaluate your project? Why? Make sure to refer to the design process and to your project details as well.

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

(6 marks)
Study the diagram below and answer the following question

a. Complete the Table below by giving the line description and its application with reference to the figure above. Line type D is done for you.

<table>
<thead>
<tr>
<th>Line Types</th>
<th>Line Description</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(5 marks)

b. Divide line AB into 10 equal parts.

A __________________________ B

(1 mark)
c. Bisect angle ABC

![Diagram of angle ABC]

\[ \text{Bisect angle ABC} \]

\[ \angle ABC \]

\[ \text{A} \]

\[ \text{B} \]

\[ \text{C} \]

---

d. What is scale \( 2 : 1 \) means?  

\[ \text{(2 marks)} \]

\[ \text{_________________________ (1 mark)} \]

---

e. Complete the table below by giving 2 differences between first angle projection and third angle projection.

<table>
<thead>
<tr>
<th></th>
<th>First Angle Projection</th>
<th>Third Angle Projection</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{(1 mark)} \]
Question B17

(a) Projection of the triangle ABC onto the horizontal and vertical planes is given below. Use any method of your choice to determine the true shape of triangle ABC and true angle of inclination to either to the horizontal or the vertical plane.
b. Complete the front view of two intersecting cylinders by drawing the lines of intersections.
c. Construct a left-hand circular section spring which has a 80 mm diameter, a 70 mm lead and is made from 15 mm diameter wire. Show one complete turn of the spring.
d. Study the given square pyramid and answer the following questions
i. Find the true length of the given sides of the square pyramid using rotation method.

\[1a = \quad \]
\[2b = \quad \]
\[3c = \quad \]

(4 marks)
ii. Draw the development of the given square pyramid using the triangular method.

(4 marks)
QUESTION B18

(13 marks)

a. Determine the magnitude and the line of action of the resultant for the co-planar parallel force system

\[ 20N \quad 35N \quad 15N \quad 30N \]

a + SCALE 1mm : 1N

b. Determine the resultant force, point of application and the equilibrium force of the co-planar, non-concurrent force system.

\[ 25N \quad 35N \quad 15N \quad 15N \]
c. Given below is the Space diagram of parallel forces acting on a beam. Use the Link or Funicular and Force or Load line with Polar diagrams to determine the:
   1) Position of the resultant
   2) Reactions at the supports RL and RR.

\[
\begin{align*}
25 \text{ N} & \quad 15 \text{ N} & \quad 30 \text{ N} \\
\text{RL} &= \_\_\_\_\_ & \text{RR} &= \_\_\_\_\_
\end{align*}
\]

Scale: ___________________
QUESTION B19

a. A CI Jaw Support is shown below. Draw, with hidden details, the following views of the CI Jaw Support in first angle projection:

- a front view from direction A
- a side view from direction B, and

Use any scale of your choice, give 6 main dimensions, and identifying the drawing.
DO QUESTION CI JAW SUPPORT here
**TONGA FORM SIX CERTIFICATE**

**2014**

**DESIGN TECHNOLOGY**

*(FOR MARKERS USE ONLY)*

<table>
<thead>
<tr>
<th>SECTIONS</th>
<th>MARK</th>
<th>CHECK MARKER</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Major 1</td>
<td>![Box]</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Major 2</td>
<td>![Box]</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Major 3</td>
<td>![Box]</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Major 4</td>
<td>![Box]</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Major 5</td>
<td>![Box]</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td><strong>TOTAL MARKS</strong></td>
<td></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>