INSTRUCTIONS

1. This paper consists of THREE sections.

   SECTION A    Multiple Choice    15 Marks
   SECTION B    Long Answers       33 Marks
   SECTION C    Options             72 Marks

2. Write your Student Personal Identification Number (SPIN) on the top right hand corner of this page and on page 27.

3. SECTION A and SECTION B are COMPULSORY.

4. SECTION C consists of FIVE options. You are required to answer only FOUR of the FIVE options.

5. Answer ALL questions in the space provided in this booklet.

6. Check that your paper consists of 27 pages. Pages 25-26 has been deliberately left blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL MARKS

120
SECTION A: MULTIPLE CHOICE  

(15 marks)

Place a tick in the box corresponding to the correct answer.

For example:

\[
\begin{array}{cccc}
\sqrt{} & & & \checkmark \\
A & B & C & D \\
\end{array}
\]

If you want to change your answer to D, cross out A and tick the box under D.

\[
\begin{array}{cccc}
\checkmark & & & \checkmark \\
A & B & C & D \\
\end{array}
\]

1. When a classmate receives a severe electrical shock, the first thing you should do is:

A. try to resuscitate your classmate.  
B. switch off the power immediately.  
C. call to find out if your classmate is alive.  
D. report the incident to the teacher immediately.

2. Accidents in the workshop can be caused by:

A. working hard.  
B. working long hours.  
C. concentrating on the work.  
D. following the steps of instruction.

3. Galvanized nails are made of steel and coated with:

A. Zinc.  
B. Brass.  
C. Copper.  
D. Aluminium.
4. The size of the fuse to protect the power points circuit in a home is:
   A. 5 amps.  
   B. 8 amps.  
   C. 10 amps.  
   D. 15 amps.  

5. An electric kettle element conduction, can be tested with a simple _______ test.
   A. voltage  
   B. reverse  
   C. continuity  
   D. interconnected  

6. Which of the following is NOT a window frame member?
   A. Sill  
   B. Head  
   C. Jambs  
   D. Braced  

7. What is the part/component that fix the wall frame steady?
   A. Stud.  
   B. Noggin  
   C. Top plate.  
   D. Diagonal brace.  

8. The air cleaner of a petrol engine prevents ____________ from entering the engine.
   A. Filtered air  
   B. fuel and air.  
   C. fuel impurities.  
   D. dust and impurities.
9. In the ignition system of a petrol four stroke engine, the component that minimizes the spark at the contact breaker point is the:

A. coil.  
B. condenser.  
C. Distributor  
D. ignition switch.  

10. Air Gap in a water tap allows:

A. air pressure.  
B. water pressure.  
C. user convenience  
D. water to run faster.  

11. The best water tap to use in public places is:

A. Plug tap.  
B. Spring tap.  
C. Plastic plug tap  
D. Screw down tap.  

12. Centre Punch is a ________ tool.

A. testing  
B. cutting  
C. marking  
D. measuring  

13. A divider is used for:

A. scribing straight lines.  
B. marking position for drilling.  
C. dividing a line into several equal parts.  
D. measuring the external diameter of a pipe.
14. The drawing which gives the details of doors and windows of a building is:

A. floor plan.
B. end elevation.
C. front elevation.
D. sectional elevation

15. What is the type of line indicated by number 2 on the diagram shown below?

A. Outline.
B. Centre line.
C. Extension line.
D. Dimension line.
**SECTION B: LONG ANSWER**  
(33 marks)

YOU ARE REQUIRED TO ANSWER ALL THE QUESTIONS IN THIS SECTION.

**QUESTION ONE:**  
**SMALL ENGINE**  
(7 marks)

1. Explain what happen in each stroke of a four stroke engine, the first one (A) is given as an example.

   A. Intake Stroke:
      i. Inlet valve open, exhaust closed
      ii. Fuel/air mixture drawn into cylinder.

   B. Power Stroke
      i. ________________________________
      ii. ________________________________

   C. Compression Stroke:
      i. ________________________________
      ii. ________________________________

   2. Describe the function of filter and injector related to diesel fuel system.
      ________________________________
      ________________________________

   3. How fuel ignited in a petrol engine?
      ________________________________
      ________________________________
QUESTION TWO: BASIC ELECTRICITY (7 marks)

1. Electricity is a source of power which may convert electrical energy to other form of energy to be used. Fill in a good example of the following form of energy.

<table>
<thead>
<tr>
<th>Form of Energy</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Heat</td>
<td></td>
</tr>
<tr>
<td>B Motion</td>
<td></td>
</tr>
</tbody>
</table>

2. Name the electrical fittings shown by the diagram below.

**FLOOR PLAN OF GARAGE AND LAUNDRY**

- a. __________________________
- b. __________________________
- c. __________________________
- d. __________________________

<table>
<thead>
<tr>
<th>4 Marks</th>
<th>a.</th>
<th>b.</th>
<th>c.</th>
<th>d.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NR</td>
</tr>
</tbody>
</table>
3. Study the connection of primary cells shown below and complete the reading of the voltmeters.

![Diagram of 3 primary cells in series with a voltmeter reading box]

Voltmeter reading: ___________________________
**QUESTION THREE: BASIC PLUMBING**

(6 marks)

1. Complete the table below by giving correct name and use of the given pipe fittings.

<table>
<thead>
<tr>
<th>Pipe Fittings</th>
<th>Name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>NR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>NR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>NR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>NR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>NR</td>
</tr>
</tbody>
</table>

a. Describe the difference between the soil and ablutionary fixtures.

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
QUESTION FOUR: BUILDING CONSTRUCTION (7 marks)

1. Describe the purpose of each process under preparing site and setting out footing.

<table>
<thead>
<tr>
<th>Processes</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Erect Profile</td>
<td></td>
</tr>
<tr>
<td>b. Datum height</td>
<td></td>
</tr>
<tr>
<td>c. 3,4,5 method</td>
<td></td>
</tr>
<tr>
<td>d. Leveling</td>
<td></td>
</tr>
</tbody>
</table>

2. What are the TWO properties that should achieve when constructing the wall frame?

_______________________________________________________________________

_______________________________________________________________________

3. Explain why the width of the footing is wider than the width of the wall frame?

_______________________________________________________________________

_______________________________________________________________________
QUESTION FIVE: DESIGN (6 marks)

1. Write down the name of the project that you design and make this year.

   Project:
   _____________________________________________________________

   List TWO things that should have been done to improve the outcome of your project.
   a. ___________________________________________________________
   b. ___________________________________________________________

2. Briefly describe the project assessment elements listed below.
   a. Quality:
      ___________________________________________________________
      ___________________________________________________________
   b. General Appearance:
      ___________________________________________________________
      ___________________________________________________________
SECTION C: OPTIONS (72 marks)

INSTRUCTION: You are required to attempt only FOUR (4) of the FIVE options

Each option worth 18 Marks

OPTION ONE: HOME APPLIANCES

OPTION TWO: TECHNICAL DRAWING

OPTION THREE: LAND SURVEYING

OPTION FOUR: NAVIGATION

OPTION FIVE: ELECTRONICS
1. Study the Wick Stove given below then:

**Wick Stove**

a. Name TWO points why the Wick Stove is an ideal home appliance?

- i. _____________________________________________________________
- ii. ___________________________________________________________

b. List THREE important points on how to maintain a Wick Stove.

- i. _____________________________________________________________
- ii. ___________________________________________________________
- iii. ___________________________________________________________

2. Study the Benzene Pressure Iron and complete the table given below by give ONE function of each benzene pressure iron parts.

**Benzene Pressure Iron**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Function</th>
<th>3 Marks</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Fount</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Body</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Pump</td>
<td></td>
<td>NR</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Study the Kerosene Pressure Lamp given below then:

Kerosene Pressure Lamp

a. Explain FOUR steps of lighting the kerosene pressure lamp.

i. ________________________________

ii. ________________________________

iii. ________________________________

iv. ________________________________

4. The table below is about kerosene pressure lamp problem analysis. Complete the table by writing the ONE cause and ONE remedy of each problem.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Causes of Problem</th>
<th>Remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Lamp blazes up and smokes when lighting</td>
<td>i.</td>
<td>i.</td>
</tr>
<tr>
<td>2 Light goes dim or goes out</td>
<td>i.</td>
<td>i.</td>
</tr>
<tr>
<td>3 Lamp does not light at all</td>
<td>i.</td>
<td>i.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4 Marks</th>
<th>i.</th>
<th>ii.</th>
<th>iii.</th>
<th>iv.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6 Marks</th>
<th>1.i</th>
<th>1.i</th>
<th>2.i</th>
<th>2.i</th>
<th>3.i</th>
<th>3.i</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OPTION TWO: TECHNICAL DRAWING (18 marks)

1. Draw an isometric drawing of the object shown below. Use the given point A as the starting point of your drawing. Take your measurement from the given drawing.

![Isometric Drawing]

<table>
<thead>
<tr>
<th>6 Marks</th>
<th>Construction Lines</th>
<th>Accuracy</th>
<th>Line work</th>
<th>Neat</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. A **CI Jaw Support** is shown below. Draw the front view from A, with hidden details in third angle projection.

Use scale 1 : 1 and give at least 4 dimensions.
1. A block of land - ABCDE, is drawn with a scale of 1:1000. Use the block of land given to answer question A on the next page.
i. Complete the field book below of the same block of land ABCDE using the compass traverse method.

**Field Book**

<table>
<thead>
<tr>
<th>LEG</th>
<th>DISTANCE</th>
<th>FORWARD BEARING</th>
<th>BACKWARD BEARING</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>114 m</td>
<td>3.5˚</td>
<td>183.5˚</td>
</tr>
<tr>
<td>BC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. The following field book entry was made during a survey of a town plot for a classroom site. The offset method was used to obtain and record the data.

**FIELD BOOK ENTRY**

<table>
<thead>
<tr>
<th>STATION</th>
<th>B 1400</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO F 590</td>
<td>1210</td>
</tr>
<tr>
<td>1080</td>
<td>420 TO D</td>
</tr>
<tr>
<td>TO GATE E 370</td>
<td>600</td>
</tr>
<tr>
<td>410</td>
<td>690 TO C</td>
</tr>
<tr>
<td>STATION</td>
<td>A</td>
</tr>
</tbody>
</table>

AB BEARS 060˚
**ALL MEASUREMENT IN METRES**

Use scale of 1:10,000 to plot the traverse using the OFFSET METHOD.

<table>
<thead>
<tr>
<th>6 Marks</th>
<th>Bearing</th>
<th>Principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OPTION FOUR: NAVIGATION (18 marks)

1. Use the given diagram to plot the following course: (8 marks)
   
i. A boat left anchorage (position A) at 0745 hr on a course of 095º to follow a clearance course about Kailahi Point.
   
ii. When abeam of Ihu Point a new course of 320º was set.
   
iii. When the church and Niu Island wharf were in transit a new course of 065º was followed until the boat intersected the leading lights transit from Monū Island wharf.
   
iv. The boat then followed the leading lights to tie at the wharf.
2. If the distance travelled was calculated to be 21 nautical miles with an average speed of 8.4 knot. What was the expected arrival time (EAT) of the boat?

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

3. On the Tongatapu Group Chart the magnetic variation was 13° 10’ E in 1995. The annual drift is 03’ E. Calculate the magnetic variation for this year, 2015.

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

4. Briefly explain the following sea terms:

i. Abeam:

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

ii. Beacons:

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

iii. In Transit:

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

iv. Soundings:

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________
**OPTION FIVE: ELECTRONICS (18 marks)**

1. The following table shows pictures of electronics components. Complete the table with the name, symbol and the function of each component.

<table>
<thead>
<tr>
<th>PICTURE</th>
<th>NAME</th>
<th>SYMBOL</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="NR" alt="Image" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="NR" alt="Image" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="NR" alt="Image" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="NR" alt="Image" /></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Manufactures of Light Emitting Diode (LED) provide you with two possible ways to easily identify the negative terminal of an LED. Describe each way.

i. ____________________________________________________________

ii. __________________________________________________________
3. **CAPACITOR**
   
i. Calculate the value of the given capacitor. Give your answer in micro Farads (μF)

![Capacitor Diagram]

4. Use the information below to work out the value of the two resistors.

Value of Resistor 1:

![Resistor 1 Diagram]

Value of Resistor 2 Blue:

![Resistor 2 Diagram]
THIS PAGE HAS BEEN DELIBERATELY LEFT BLANK.
**TONGA SCHOOL CERTIFICATE**

**2015**

**INDUSTRIAL ARTS**

* (For markers Use only)

<table>
<thead>
<tr>
<th>SECTION</th>
<th>MARK</th>
<th>CHECK MARK</th>
<th>TOTAL MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td>33</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>