NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2017

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 19 pages.
QUESTION 1: CONSTRUCTION, SAFETY AND MATERIALS

1.1
- Never use unsafe supports such as step ladders, drums, loose bricks, or crates on the scaffolding. √
- The worker should have worn a safety harness/safety rope. √
- The worker should ensure that there are sufficient guard rails on the scaffolding.
- Always wear protective clothing when working on scaffolding/non slip safety footwear.
- The worker should ensure that the area is free of liquids and obstacles. (2)

ANY TWO OF THE ABOVE

1.2
- To prevent electric shock. √
- To keep the power tools in a working condition.
- To ensure the safety of the user.
- Live exposed wires can cause electrocution or fire. (1)

ANY ONE OF THE ABOVE

1.3
- The worker can be injured by the moving blade. √
- Measuring tools/tools may be damaged when touching the moving blade.
- Moving parts of the machine can be damaged (1)

ANY ONE OF THE ABOVE

1.4
- Tamping rod/rod √
- Cone/frustum/mould √
- Base plate/waterproof base √
- Folding ruler, tape measure, steel ruler/level/straight edge
- Shovel (3)

ANY THREE OF THE ABOVE

1.5
- Concrete mixer/machine mixed √
- Ready mixed concrete (1)

ANY ONE OF THE ABOVE

1.6
1.6.1 B √ (1)
1.6.2 C √ (1)
1.6.3 D √ (1)
1.6.4 F/M √ (1)
1.6.5 G √ (1)
1.6.6 J √ (1)
1.6.7 L √ (1)
1.6.8 I √
1.6.9 H √
1.6.10 A √

1.7 1.7.1

1.7.2 PLAN COURSE OF A QUOIN IN ENGLISH BOND/
CORNER BUILT IN ENGLISH BOND √

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATE’S MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stretcher course</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Corner brick</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Queen closer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Header course</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

1.7.3 • The queen closer creates the bond in the wall/quarter lap. √
• The queen closer closes the gap in the wall in the header course.
• The queen closer prevents a straight vertical mortar joint.
ANY ONE OF THE ABOVE (1)

1.8

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATE’S MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supporting walls</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Roof</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
1.9 1.9.1
• A brush/sponge can be used to apply paint to a ceiling. √
• A roller can be used to apply paint to a ceiling.
• A spray gun/spray-painting equipment can be used to apply paint to a ceiling.
• A sponge can be used to apply paint to a ceiling.

ANY ONE OF THE ABOVE

1.9.2
• Painting it with a brush will avoid fine paint spray on the walls and the floors. √
• Using a roller will be quicker than using a brush/prevent stripes.
• Spray painting will be quicker than painting with a brush and a roller.
  A sponge can be used for the decorative application of paint.

• ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.10 1.10.1 Skirting/tile skirting √

1.10.2 Cornice √

ANY SUITABLE MATERIAL INDICATED FOR THE MANUFACTURING OF THE ABOVE COMPONENTS WILL BE ACCEPTED.

[30]
QUESTION 2: ADVANCED CONSTRUCTION AND EQUIPMENT

2.1  2.1.1  D √  (1)
     2.1.2  B √  (1)
     2.1.3  B √  (1)
     2.1.4  D √  (1)
     2.1.5  C √  (1)

2.2  2.2.1  Dumpy level/surveying instrument/levelling instrument √  (1)

2.2.2  
- To measure vertical and horizontal heights/levels √  
- To measure vertical and horizontal angles
- To measure distances
- It is used for surveying/setting out of buildings.  (1)

ANY ONE OF THE ABOVE

2.2.3  Tripod/baseplate √  (1)

2.2.4  Telescopic staff/levelling rod √  (1)

2.2.5  
- To prevent it from getting damaged and wet. √  
- To protect the instrument against dust/moisture/bumps/sun
- It is fragile.  (1)

ANY ONE OF THE ABOVE

2.3  2.3.1  Rib and block concrete √  (1)

2.3.2  A – Concrete floor slab/concrete/slab √  
       B – Concrete hollow block/rib block/block √
       C – Reinforced steel mesh/reinforcement bars/bars √  (3)

2.3.3  
- The rib and block method can be used anywhere, even in water. √  
- Components are precast, thus it saves a lot of building time.
- Placing is relatively quick.
- Provides excellent resistance against soil movement.
- Work can proceed, despite the weather conditions.
- Plastering the underside of the floor can take place without any delays.
- No extensive formwork or shuttering is necessary.
- It is approximately 30% lighter than in situ floor slabs.
- No skilled labour is required as the supply company also does the installation.
- It is cheaper.  (1)
- Less quantity of material is used.

ANY ONE OF THE ABOVE
2.4 2.4.1 A - Wall tie √
     B - Damp proof course/DPC √

2.4.2 • Under the window sill √
• Under floor slab/Between the sub- and super structure
• At the base of external and internal walls
• Vertically at jambs or door frames
• Roof/parapet wall
• Above the lintel of a cavity wall

ANY ONE OF THE ABOVE

2.4.3 The cavity in the walls are to:
• prevent rain water from penetrating the inner skin of the wall. √
• provide high insulation against heat, cold and sound.
• enable the use of cheaper or alternative materials for inner skin of the wall.

ANY ONE OF THE ABOVE

2.5 Intrados – Is the inner surface of arches √
Extrados – Is the outer surface of arches √

2.6 2.6.1 Cube/Cube mould/Mould √
ANY ONE OF THE ABOVE

2.6.2 Tamping rod/Rod/Trowel/Shovel √
ANY ONE OF THE ABOVE

2.6.3 Cube test √

2.6.4 • The test is done to determine the compressive strength/crushing strength of concrete. √
• Test the strength of concrete.

ANY ONE OF THE ABOVE
2.7

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATES MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shear bar correctly drawn</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Stirrups correctly drawn and spaced</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2</strong></td>
<td></td>
</tr>
</tbody>
</table>

2.8  
2.8.1 Twisted ribbed bar ✔
2.8.2 Ribbed bar ✔

2.9  
2.9.1  
- Wooden planks/timber ✔
- Block board
- Laminated board
- Shutter board
- Plywood boards
- Metal shutter
ANY ONE OF THE ABOVE

2.9.2  
B – Wedges ✔
C – Yoke ✔
D – Clamp/Cleat ✔
E – Threaded rod/bolt and nut/bolt ✔
ANY ONE OF THE ABOVE

2.9.3  
- The yokes will not be tightened/Yokes will not be able to be joined. ✔
- The formwork will not be kept in place/collapse.
- The formwork will not be square.
- The yokes will not be in place.
- The formwork will not be rigid.
- Concrete will escape from the corners of the formwork.
ANY ONE OF THE ABOVE
2.10  
- There is insufficient soundproofing  
- There is less insulation against cold and heat  
- It cannot be used externally  
- The dry wall can easily be damaged/burnt  
- The dry wall cannot carry heavy loads

ANY ONE OF THE ABOVE

2.11

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cladding correctly drawn</td>
<td>1</td>
</tr>
<tr>
<td>Cornice/moulding at ceiling correctly drawn</td>
<td>1</td>
</tr>
<tr>
<td>Skirting/quadrant at floor correctly drawn</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3</td>
</tr>
</tbody>
</table>

2.12  
- Preformed concrete piles  
- Steel tube caisson piles  
- Driven in-situ piles  
- Short bored piles

ANY ONE OF THE ABOVE

[40]
QUESTION 3: CIVIL SERVICES

3.1  
3.1.1  S – trap √ (1)

3.1.2  To prevent sewer-gas (foul air) from the sewerage system to enter the building. √ (1)

3.2  
• The season/Cloud cover/weather conditions √
• Time of day √
• Duration of sunshine
• Cleanliness of glass panel
• Shadows over glass panels
• The intensity of direct sunlight
• The position/orientation of the panel to north
• Pitch of the panel
• The type of solar heater/panel

ANY TWO OF THE ABOVE (2)

3.3  
3.3.1  Heating element/Element √ (1)

3.3.2  
• The cold water inlet is placed at the bottom of the geyser so that the incoming cold water does not mix with the hot water/incoming cold water heated by the element. √
• The hot water outlet is placed at the top to discharge hot water which is concentrated at the top of the geyser. √ (2)

OR ANY OTHER ACCEPTABLE ANSWER

3.3.3  Temperature and pressure safety valve/Safety valve/Pressure valve √ (1)

3.4  
3.4.1  
• The grid receives/drains storm water/allow storm water to enter storm water system/pipe. √
• Water is guided to flow off our roads on to the road kerbs and then into the road channel into the storm water pipes.
• Prevent waste like paper and plastic bags to block the storm water pipes.
• For safety purposes

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)

3.4.2  
• Roads will overflow with storm water. √
• Damage to the roads may be possible because of the storm water.
• Storm water will not be able to enter the grid.
• Storm water will flood surrounding areas

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)
3.5
- Wind pump √
- Submersible water pump √
- Water pump
- Manual hand pump/hand pump
- Electric pump
- Solar powered pump

ANY TWO OF THE ABOVE

3.6

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATES MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorescent light</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Distribution board</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Double-pole light switch (one-way)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Electric wiring</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

DRAWING SYMBOLS IN TEXTBOOKS FOR ABOVE ITEMS WILL ALSO BE ACCEPTED

(8)
### 3.7 Assessment Criteria

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATE’S MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rodding eye</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Gully</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ventilation pipe/Vent pipe</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Branch pipes 45°</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Inspection eyes</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Any THREE abbreviations</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>10</strong></td>
<td></td>
</tr>
</tbody>
</table>

(10) [30]
QUESTION 4 QUANTITIES AND CALCULATIONS AND JOINING

4.1 4.1.1 Chipboard/drywall/counter sunk head screw/pozi drive screw √
Use:
Joining fabricated boards/machine made boards/board products/timber √

4.1.2 Steel cut nail/masonry nail √
Use:
Mainly used to fix skirting and cleats to brickwork √

OR

Oval nail
Use:
Used at edge of timber to prevent the timber from splitting

OR

Floor nail
Use:
Used to secure floor planks

4.1.3 Sleeve anchor/Rawl bolt √
Use:
Fixing objects into concrete and brickwork/to join truss hangers against a wall √

4.2
- Wire nails/clamp/hurricane clamps √

4.3
- Quicker to drive in than screws √
- Available in a variety of lengths, thicknesses and strengths √
- Various heads for invisible or decorative use
- Cheaper than screws
- Can be made of rust proof material (copper or stainless steel)
- Can be quickly removed
- Tough and resilient
- Can be straightened and reused
- Nails requires a less skilful worker
- Not as time consuming as when inserting screws.
- Application of nails is much faster than screws.

ANY TWO OF THE ABOVE

4.4
- Copper pipe/polycop pipes/PVC pipes/Composite pipes √
4.5  4.5.1  38/38 mm ✓
4.5.2  3 ✓
4.5.3  3 374/3 374 mm ✓
4.5.4  3 600/3 600 mm ✓
4.5.5  9 600/9 600 mm ✓
4.5.6  3 600/3 600 mm ✓
4.5.7  17 250/17 250 mm ✓
### 4.6

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>B</strong></td>
<td><strong>C</strong></td>
<td><strong>D</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inside measurement of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long walls  = 7 000 mm – 2/220 mm</td>
<td>( \sqrt{ } ) = 6 560 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short walls  = 4 000 mm – 2/220 mm</td>
<td>( \sqrt{ } ) = 3 560 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4)</td>
<td></td>
</tr>
<tr>
<td>1/</td>
<td>6.56</td>
<td>Inside area of the room is</td>
<td>( \sqrt{ } ) 23.35 m(^2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Area of one ceiling board:</td>
<td></td>
</tr>
<tr>
<td>1/</td>
<td>4.2</td>
<td>One board is 4 200 mm x 1 200 mm</td>
<td>( \sqrt{ } ) 5.04 m(^2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length of skirting:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>= (6 560 + 3 560) x 2</td>
<td>( \sqrt{ } )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 20 240 – 3 000 mm</td>
<td>( \sqrt{ } )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 17.24 m</td>
<td>( \sqrt{ } )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 13 120 + 7 120 – 3 000 mm</td>
<td>( \sqrt{ } )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 17 240 mm</td>
<td>( \sqrt{ } )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 17.24 m</td>
<td>( \sqrt{ } )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 6 560 + 6 560 + 3 560 + 3 560 – 3 000 mm</td>
<td>( \sqrt{ } )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 17 240 mm</td>
<td>( \sqrt{ } )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 17.24 m</td>
<td>( \sqrt{ } )</td>
</tr>
</tbody>
</table>

(4)

**IF A CANDIDATE DID NOT USE THE ANSWER SHEET TWO MARKS MUST BE DEDUCTED FROM THE TOTAL**

**IF A CANDIDATE DID NOT CONVERT TO METRES THE CANDIDATE SHOULD NOT BE PENALISED BUT THE FINAL ANSWER MUST BE IN SQUARE METRES/METRES**

**IF THE CANDIDATE WROTE THE MEASUREMENTS IN THE WRONG COLUMN ONE MARK MUST BE DEDUCTED FROM THE TOTAL**

[30]
QUESTION 5: APPLIED MECHANICS

5.1  5.1.1 \( (A_1 \times d) + (A_2 \times d) \)

Total area

\[
\frac{\int \int \int \int}{4 275 \text{ mm}^2} \times \int (3 600 \text{ mm}^2 \times 30 \text{ mm}) + (675 \text{ mm}^2 \times 25 \text{ mm}) \]

\[
\int \int \int \times \int = 108 000 \text{ mm}^3 + 16 875 \text{ mm}^3 \]

\[
\int \int \int \times \int = 124 875 \text{ mm}^3 \]

\[
\int \int \int \times \int = 29,21 \text{ mm} \]

OR

<table>
<thead>
<tr>
<th>Part</th>
<th>Area A (A)</th>
<th>X</th>
<th>AX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 600 mm²</td>
<td>30 mm</td>
<td>3 600 mm² x 30 mm = 108 000 mm³</td>
</tr>
<tr>
<td>2</td>
<td>675 mm²</td>
<td>25 mm</td>
<td>675 mm² x 25 mm = 16 875 mm³</td>
</tr>
<tr>
<td>∑</td>
<td>4 275 mm²</td>
<td></td>
<td>124 875 mm³</td>
</tr>
</tbody>
</table>

\[
X = \frac{\sum A x}{\sum A} = \frac{124 875 \text{ mm}^3}{4 275 \text{ mm}^3} = 29,21 \text{ mm} \]

IF A CANDIDATE SWOP AREA 1 AND 2 AROUND DEDUCT 1 MARK (10)
5.2.1

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>NATURE</th>
<th>MAGNITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE</td>
<td>Strut</td>
<td>92 N</td>
</tr>
<tr>
<td>DG</td>
<td>Tie</td>
<td>35 N</td>
</tr>
</tbody>
</table>

Tolerance of 1 N to either side

NOT TO SCALE DUE TO ELECTRONIC TRANSFER.
USE A MASK TO MARK THIS QUESTION.
IF THE CANDIDATE WROTE THE MEASUREMENTS IN THE WRONG COLUMN
ONE MARK MUST BE DEDUCTED FROM THE TOTAL
5.3  5.3.1  20 N/m $\sqrt{}$  

5.3.2  8 m $\sqrt{}$  

5.3.3  4 m $\sqrt{}$  

5.3.4

If the lines between B and D are straight lines no marks may be awarded for these lines.

NOT TO SCALE DUE TO ELECTRONIC TRANSFER.

USE A MASK TO MARK THIS QUESTION.

BECAUSE DISTANCES BETWEEN AB, BC, ECT. MAY DIFFER ON THE ANSWER SHEETS OF THE PROVINCES.
# ANSWER SHEET 6.1

<table>
<thead>
<tr>
<th>NO.</th>
<th>QUESTIONS</th>
<th>ANSWERS</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name the title of the drawing</td>
<td>South Elevation ✓</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Identify number 1.</td>
<td>Ridge/Ridge capping/Ridging ✓</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Identify number 2.</td>
<td>Tile roof/Tile/Roof tile/Concrete tile/roof covering ✓</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Identify number 3.</td>
<td>Gutter ✓</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Identify number 4.</td>
<td>Downpipe ✓</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Identify number 5.</td>
<td>North point/North direction/True North ✓</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Identify number 6</td>
<td>NGL/Natural ground level/Ground level ✓</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Identify number 7</td>
<td>Window Sill ✓</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Name the type of roof on the eastern side of the house.</td>
<td>Gable ✓</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Name the type of roof on the western side of the house.</td>
<td>Hipped roof ✓</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Name the material that can be used for the fascia board?</td>
<td>Wood/Timber/Cement fibre/uPVC/Plastic/Galvanised sheet metal ✓</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>On how many sides of the building will you find fascia boards?</td>
<td>3 sides ✓</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Draw the top view (roofline) of the roof for the elevation indicated in FIGURE 6.1 in the column alongside .</td>
<td><img src="image" alt="Diagram" /></td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL 15**
QUESTION 6: GRAPHICS AND COMMUNICATION

ANSWER SHEET 6.2

SECTION BB
NOT TO SCALE: USE A MASK TO MARK THIS QUESTION

Application of scale ✓ ✓ ✓

Correctness of drawing: Wall ✓ Closed eave ✓ Roof truss ✓

• All parts of the drawing must be correctly drawn to receive a mark.
• If the section is drawn the wrong way around deduct one mark