SENIOR CERTIFICATE EXAMINATIONS

CIVIL TECHNOLOGY

2018

MARKING GUIDELINES

MARKS: 200

This marking guideline consists of 17 pages.
QUESTION 1: CONSTRUCTION, SAFETY AND MATERIAL

1.1  1.1.1 A hard hat will:
    • protect the worker from any head injury. ✓
    • protect the worker from falling objects from above.

Any one of the above or any other acceptable answer

1.1.2 The worker can wear a dust mask/respiratory mask/gas mask/
    protective overall. ✓

1.1.3 If the worker does not use the safety equipment:
    • His/Her eyes can be damaged by the dust ✓
    • Debris can get into his/her eyes
    • Any part of his/her body can be injured if he/she is not wearing a protective overall.
    • Hearing can be damaged if ear protection is not used
    • Dust can be inhaled

Any one of the above or any other acceptable answer

1.2  1.2.1 Ear muffs ✓

1.2.2 In a working area where machine and equipment makes loud noises/sounds. ✓

Any other acceptable answer

1.3  1.3.1 SA or Howe roof truss ✓

1.3.2 A – King post ✓
    B – Queen post ✓
    C – Rafter ✓

1.3.3 The slope/gradient of a roof truss used for a thatch roof must be 45° and the roof truss in FIGURE 1.3 has a slope of 30°. ✓

Any one of the above

1.3.4 • Concrete tiles ✓
    • Clay tiles
    • Slate tiles

Any one or other acceptable answer

1.4 DPC is used between the concrete floor and the wall between courses of brickwork. ✓
    DPM is used under a concrete floor to cover the whole area of a room or a building or as roof underlay. ✓
1.5

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATE'S MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correctness of elevations</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Labelling of views</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Correct dimension lines</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Width of queen closer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

1.6 Galvanising is more expensive than painting but lasts longer than painting ✓

OR

Painting is cheaper than galvanising and gives a wide variety of colours and surface finishing's.

**ANY ONE OF THE ABOVE**

1.7

- Varnish ✓
- Oil
- Wax
- Coal tar creosote
- Paint
- Poisonous chemical salts (water and soluble salts)
- Organic compounds

**ANY ONE OF THE ABOVE**

1.8

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATE'S MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tongue(can be in the middle)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Groove(can be in the middle)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Board</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

1.9 Cement binds the ingredients of concrete together. ✓

1.10

- Mass concrete – is a volume of concrete that do not have any reinforcing ✓
- Reinforced concrete – is concrete that is reinforced with steel rods to strengthen the structure ✓
1.11  • Compacting by hand (rodding and spading) ✓
• Compacting through vibration (Mechanical vibrator)
ANY ONE OF THE ABOVE

1.12  • A slump test is used to test workability/consistency of concrete. ✓
• A cube test is used to test compressive/crushing strength of concrete. ✓

1.13  • Cover strip/H-strip/Decorative grid strips ✓
• Jointing /ceiling tape/Gauze
• Jointing compound (rhinolyte)
ANY ONE OF THE ABOVE
QUESTION 2: ADVANCED CONSTRUCTION AND EQUIPMENT

2.1 2.1.1 • A – Steel capping ✓
• C – Steel tip ✓ (2)

2.1.2 Undisturbed earth ✓ (1)

2.1.3 A drop hammer ✓ (1)

2.1.4 Pre-cast concrete piles can be used when:
• The soil is not stable/soft ✓
• Water content of soil is high ✓
• There’s a high water table
• Subsoil is subject to movement
• Filling materials are not sufficiently compacted
ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (2)

2.2 • Bring the water level in the one side of the transparent pipe in line with the first level. ✓
• Take the other end of the pipe to the other position where the level must be transferred, maintaining the first level and make a mark next to the water level at this point. ✓ (2)

2.3 • Tape measure ✓
• Chalk line ✓
• Builders line ✓
• Builders square
• Straight edge
• Spirit level
ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (3)

2.4 2.4.1 Angle grinder ✓ (1)

2.4.2 Grinding/cutting disc ✓ (1)

2.4.3 • The safety guard protects the worker against sparks or debris from discs and materials. ✓
• The safety guard protects the body parts of the worker against the rotating blade.
ANY ONE OF THE ABOVE (1)

2.5 2.5.1 • Centre/Turning piece/Profile ✓ (1)

2.5.2 • Key brick ✓ (1)
2.6  A – Compression force ✓
     B – Tensile force ✓

2.7

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATE’S MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Courses of bricks above the two existing courses</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Mortar between brickwork</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Symbol for concrete in the cavity between the walls</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>The symbol for concrete in the foundation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>The symbol for back filling on one side only</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>The damp proof between the walls and the cavity</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>The weep hole</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>One wall tie</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>10</strong></td>
<td></td>
</tr>
</tbody>
</table>

2.8  Dry wall ✓

2.9  Disadvantages of drywalls:
- They are less soundproof than brickwork. ✓
- They are less fireproof that brickwork.
- Drywalls must be joined together or attached to existing walls, to ensure sturdiness.
- Drywalls cannot carry heavy loads.

**ANY ONE OF THE ABOVE**
2.10 2.10.1  A - Anchor bar ✓
        B - Shear bar ✓ (2)

2.10.2 Structural failure will occur ✓ (1)

2.10.3 • To keep the main or anchor bars together. ✓
        • Helps to resist shear stress
        ANY ONE OF THE ABOVE (1)

2.11 A - Threaded rods and nuts ✓
      B - Laggings ✓
      C - Lining ✓
      D - Collar ✓
      E - Vertical clamps ✓ (5)

2.12 C, B, A (1)

[40]
QUESTION 3: CIVIL SERVICES

3.1  
3.1.1 E ✓ (1)
3.1.2 G ✓ (1)
3.1.3 D ✓ (1)
3.1.4 F ✓ (1)
3.1.5 C ✓ (1)
3.1.6 B ✓ (1)

3.2 A water trap is installed:
• under sinks ✓
• baths
• toilets
• at a gully
• at a shower
ANY ONE OF THE ABOVE (1)

3.3 P trap or S trap or Bottle trap ✓ (1)

3.4  
3.4.1 ✓ ✓ (2)

3.4.2 ✓ ✓ (2)

3.4.3 ✓ ✓ (2)
3.5

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATE’S MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>External walls with plaster and holes</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Inner wall with hole and plaster</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Inlet pipe with T-junction</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Outlet pipe with T-junction</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Liquid level</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Concrete cover with manholes</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TOTAL:</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

3.6
- Boreholes ✓
- Wells
- Rain water
- Snow
- Rivers
- Desalination

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

(1)

3.7
Storm water systems are used to carry storm water to rivers or low-lying dams. ✓

OR ANY OTHER ACCEPTABLE ANSWER

(1)

3.8
- Solar energy ✓
- Nuclear power
- Hydro electricity
- Wind
- Natural gas
- Generator
- Inverter

ANY ONE OF THE ABOVE

(1)
3.9 • Solar geysers are environmentally friendly. ✓
• Solar geysers can be used in areas where no electricity is available.
• Hot water is available at a very low cost once the installation cost has been covered.

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

3.10 • Using solar power as an alternative source of power. ✓
• Using appliances only when necessary.
• Using of low energy or LED light bulbs.
• Switch of lights in rooms that are not in use.
• Shower for shorter periods to prevent over use of geyser.
• Boil only the required quantity of water for a purpose.
• Use a geyser timer
• Use of gas

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1) [30]
QUESTION 4: QUANTITIES, MATERIALS AND JOINING

4.1

4.1.1  B ✓

4.1.2  C ✓

4.1.3  D ✓

4.1.4  A ✓

4.1.5  C ✓

4.2

4.2.1  2 030/2 030 mm ✓

4.2.2  1 ✓

4.2.3  44/44 mm ✓

4.2.4  813/813 mm ✓

4.2.5  200/200 mm ✓

4.2.6  32/32 mm ✓

4.2.7  220/220 mm ✓
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Centre line: Superstructure</td>
<td></td>
</tr>
<tr>
<td>2/ 7 000 mm</td>
<td></td>
<td>= 14 000 mm ✓</td>
<td></td>
</tr>
<tr>
<td>2/ 4 200 mm</td>
<td></td>
<td>= 8 400 mm ✓</td>
<td></td>
</tr>
<tr>
<td>TOTAL:</td>
<td></td>
<td>= 22 400 mm</td>
<td></td>
</tr>
<tr>
<td>Minus 4/ 220</td>
<td></td>
<td>= 880 mm ✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 21 520 mm ✓</td>
<td></td>
</tr>
</tbody>
</table>

1/ 21,52 ✓
Area of walls for superstructure

2,6 ✓ 55,95 m² ✓

(3)

1/ 2,1 ✓
Area of side door

0,9 ✓ 1,89 m² ✓

(3)

1/ 2,4 ✓
Area of garage door

2,1 ✓ 5,04 m² ✓

(3)

1/ 1,5 ✓
Area of window

0,45 ✓ 0,68 m² ✓

(3)

Total area of wall after deductions

= 55,95 m² - 1,89 m² - 5,04 m² – 0,68 m² ✓

= 48,34 m² ✓

(2)

(18)
QUESTION 5: APPLIED MECHANICS

5.1

\[(A_1 \times d) + (A_2 \times d)\]

Total area \(= (3\,600\, \text{mm}^2 \times 30\, \text{mm}) + (900\, \text{mm}^2 \times 70\, \text{mm})\)

\[= \frac{108\,000\, \text{mm}^3 + 63\,000\, \text{mm}^3}{4\,500\, \text{mm}^2}\]

\[= \frac{171\,000\, \text{mm}^3}{4\,500\, \text{mm}^2}\]

\[= 38\, \text{mm}\]

OR

<table>
<thead>
<tr>
<th>Part</th>
<th>Area</th>
<th>X</th>
<th>AX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60 mm x 60 mm = 3,600 mm²</td>
<td>30 mm</td>
<td>108,000 mm³</td>
</tr>
<tr>
<td>2</td>
<td>15 x 60 = 900 mm²</td>
<td>70 mm</td>
<td>63,000 mm³</td>
</tr>
<tr>
<td>∑</td>
<td>4,500 mm²</td>
<td></td>
<td>171,000 mm³</td>
</tr>
</tbody>
</table>

\[X = \frac{\sum Ax}{\sum A}\]

\[= \frac{171,000\, \text{mm}^3}{4,500\, \text{mm}^2}\]

\[= 38\, \text{mm}\]

(9)
5.2

USE A MASK TO MARK THIS QUESTION

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>NATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE</td>
<td>Tie ✓</td>
</tr>
<tr>
<td>BD</td>
<td>Tie ✓</td>
</tr>
<tr>
<td>CD</td>
<td>Strut</td>
</tr>
<tr>
<td>DE</td>
<td>Strut ✓</td>
</tr>
</tbody>
</table>

Tolerance of 1 N to either side.

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### 5.3 Marking Guidelines

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARKS</th>
<th>CANDIDATE'S MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct shape of shear force diagram</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Value of shear forces correctly measured and indicated</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Horizontal lines indicated</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

If the drawing is not drawn to the correct scale, penalise the candidate with 1 mark.
**QUESTION 6: GRAPHICS AND COMMUNICATION**

**CENTRE NUMBER:**

**EXAMINATION NUMBER:**

**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>Identify the type of eave construction used in the drawing.</td>
<td>Open eave</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>State the minimum pitch (slope) of number 1, if galvanised roof sheeting is used.</td>
<td>5° - 10°</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Identify number 2.</td>
<td>Tie-beam</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>State the standard dimension of number 3.</td>
<td>38 mm x 38 mm</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>State the purpose of number 4.</td>
<td>To cover the opening between the wall and the ceiling.</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Name the timber that is shown on top of the external wall marked number 5.</td>
<td>Wall plate</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Draw the drawing symbol for number 6 in the next column.</td>
<td>![Drawing Symbol]</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Explain the purpose of number 7.</td>
<td>To prevent dust, insects, rodents, wind and birds to enter the building</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Name ONE material that can be used for number 8.</td>
<td>PVC, aluminium, galvanised sheet metal.</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Identify number 9.</td>
<td>Fascia board</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Identify number 10.</td>
<td>Down pipe</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Draw a neat freehand line diagram of a Fink or W roof truss in the next column.</td>
<td>![Fink or W Roof Truss]</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL:** 15
### Answer Sheet 6.2

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARKS</th>
<th>CANDIDATES MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>External walls</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>NGL (correctly drawn)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>FFL (correctly drawn)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Window</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Window sill</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Door opening</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fascia board</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Rain-water down pipe</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Roof (correctly drawn)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Gutter</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ridge capping</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Determining roof height</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Any FOUR labels</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Application of scale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One or two incorrect = 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three or four incorrect = 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than five incorrect = 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No measurement correct = 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

**NOT TO SCALE: USE A MASK TO MARK THIS QUESTION**

- Application of scale: ✔️ ✔️ ✔️
- Any four labels: ✔️ ✔️ ✔️ ✔️

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