NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2015

MEMORANDUM

MARKS: 200

This memorandum consists of 18 pages.
QUESTION 1: CONSTRUCTION, SAFETY AND MATERIALS

1.1  
• Someone should have held the ladder. √
• Catch nets should be installed to prevent tools and materials from falling on people below. √
• The visitor should wear a hard hat.
• The worker should wear a tool belt.
• A scaffold could be built.
• Meeting to be moved to a safer area.

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.2  
• Always ensure that saw is sharp. √
• Use saws only for the purposes for which they were designed. √
• Safety rules for the saw must be strictly adhered to.
• Do not work with a saw with a loose or broken handle.
• Report all defects and damages immediately.
• Always keep your hands away or behind the cutting surface of the saw.
• Maintain the correct cutting direction.
• Do not bend the blades/points of saw when you are using them.
• Blunt saws require more force and may lead to unnecessary accidents.
• The work piece must be securely clamped to prevent it from moving.
• Do not test the sharpness of the teeth with your fingers

ANY TWO OF THE ABOVE

1.3  
• Trenches that are excavated must be protected with a fence. √
• Red warning lights or warning signs should be placed at intervals and must be clearly visible to warn the public of the danger.

ANY ONE OF THE ABOVE

1.4  
• Spray painting. √
• Spray painting is a better option because plastics commonly have very smooth surfaces, so spray painting is a better option. √
• Is easy to apply.
• It is quicker.

ANY TWO OF THE ABOVE

1.5  

I-beam
•

H-beam

THREE DIMENSIONAL DRAWINGS CAN ALSO BE ACCEPTED
1.6 Admixtures are used to:
- change the property of the concrete mix.
- increase the workability.
- increase or reduce the setting time.
- increase the strength.
- increases the durability.
- reducing cost.
- reduce water content.
- improve pump ability
- shorten curing time.
- change the temperature range.
- change the colour of concrete.

ANY ONE OF THE ABOVE

1.7
- Plasticisers
- Accelerators
- Retarders
- Air entrainers/entrainment admixtures
- Corrosion inhibitors
- Damp proofing
- Water-reducing admixtures
- Anti-washout admixtures
- Bonding admixtures
- Colouring admixtures/oxides

ANY ONE OF THE ABOVE

1.8
- Not fire resistant and therefore it must be treated/burns easily.
- It is more expensive than ordinary roof coverings/insurance is more expensive.
- A lot of maintenance is required/easily damaged.
- Thatch is an organic material and can rot easily.
- The thatch at the ridge capping needs to be re-thatched regularly.
- Durability is more or less between 25 and 30 years if properly maintain.
- Ideal breeding place for Insects and dust

ANY TWO OF THE ABOVE

1.9
- Corrugated iron sheeting/galvanised sheeting
- IBR sheeting
- Concrete/clay roof tiles/tiles
- Slate
- Fibre cement sheeting
- Fibre glass sheeting
- Transparent IBR sheeting
- Perspex sheeting

ANY TWO OF THE ABOVE
1.10  1.10.1

<table>
<thead>
<tr>
<th>Assessment criteria</th>
<th>Mark</th>
<th>Candidate's mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashing correctly drawn</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

1.10.2
- Waterproofing membrane with a sealing compound ✓
- Bituminous felt
- Plastic
- Copper sheet
- Galvanised sheet metal
- Lead sheet
- Aluminium sheet

ANY ONE OF THE ABOVE

1.10.3
- It is to seal off the gap between the wall and the roof. ✓
- To prevent rain from entering the roof.
- To prevent unwanted elements from entering the ceiling.

ANY ONE OF THE ABOVE

1.11  1.11.1  English bond ✓

1.11.2
- The English bond can only be built as a single brick wide wall. ✓
- One course will be a stretcher course followed by a header course.
- The second and second-last bricks will a queen closer in the header course. ✓
- If the course in a quoin on the front elevation is a stretcher course then the same course around the corner will be a course of headers.
- It is one of the strongest bond.

1.11.3
- The wall can be painted ✓
- The wall can be tiled
- The wall can be cladded (wood/stone/brick)

ANY ONE OF THE ABOVE
1.11.4 End view

1.11.5 ASSESSMENT CRITERIA  MARK  CANDIDATE'S MARK

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stretcher course</td>
<td>2</td>
</tr>
<tr>
<td>Queen closer</td>
<td>1</td>
</tr>
<tr>
<td>Header course</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>

Plan course of T junction

1.12

- Cement fibre ceiling board √
- Match board ceilings
- Sheet metal ceilings
- Knotty pine ceiling
- Gypsum board/Rhino board
- Plastic ceilings.
- Polystyrene ceilings
- Styrofoam

**ANY ONE OF THE ABOVE**

[30]
QUESTION 2: ADVANCED CONSTRUCTION AND EQUIPMENT

2.1 2.1.1 Electric mitre saw

2.1.2
- The mitre saw can be used to make accurate cross cuts at different angles.
- The mitre saw can be used to cut angles or compound angles on roof truss members
- The mitre saw can be used to saw mitres of skirtings.

ANY ONE OF THE ABOVE

2.1.3
- The mitre saw enables precision cutting.
- It will save time.

2.2
- Start by filling the pipe with water. Bring the water level in 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. Make a mark next to the water level at this point.

2.3
- It will be used to provide electricity to all portable electrical equipment on the building site where no electricity is available.
- To provide electricity for the site office.

ANY ONE OF THE ABOVE

2.4 2.4.1 Concrete spacer/Spacer/cover depth block

2.4.2
- It is used to keep reinforcement bars away from soil and sides of trenches or shuttering (formwork).
- It is used to maintain cover depth of concrete/to keep reinforcement bars in position.

ANY ONE OF THE ABOVE

2.5 2.5.1 Rib and block floor

2.5.2
- It is cheaper.
- It is lighter and easy to work with.
- It is quicker to install.
- It has a lighter load on foundations.
- Easy to trim around edges.

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER
2.5.3 • It is more economical than in situ concrete floors. √
• Very little or no shuttering is required. √
• They provide superior sound and thermal insulation. √
• It can be erected a lot quicker than in situ slabs.
• Highly skilled labour is unnecessary.
• No heavy lifting equipment is required.
• It is easier to install conduits.
• The load of the building will be lighter on the foundation.

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.6 2.6.1 • Flat √
• Semi-circular √
• Circular
• Segmental arch

ANY TWO OF THE ABOVE

2.6.2 Key brick √

2.7 Slump test – Test the workability and consistency of the concrete mix. √
Cube test – Test the compressive strength of concrete. √

2.8 2.8.1 A - Anchor bar √
B - Shear bar √
C - Stirrup/Binder √
D - Main bars of column √

2.8.2 Ribbed bars create a better bond with the concrete due to the rough surface of the bar. √

OR ANY OTHER ACCEPTABLE ANSWER

2.9 2.9.1 A – Landing / Floor √
2.9.2 B – Between 75 mm and 200 mm. √
2.9.3 C – Tread/Going √
2.9.4 D - String √
2.10

**ASSESSMENT CRITERIA**

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARK</th>
<th>CANDIDATE'S MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol for concrete foundation and concrete floor</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Damp-proof course between walls and cavity</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Damp-proofing under concrete floor</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Weep hole</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Concrete in cavity wall</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Wall tie</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dimension of total width of wall</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>9</strong></td>
<td></td>
</tr>
</tbody>
</table>

2.11 Pile foundations/raft foundations ✓

2.12 Dry wall ✓

[40]
QUESTION 3: CIVIL SERVICES

3.1

3.1.1 C/B √ (1)

3.1.2 A √ (1)

3.1.3 E √ (1)

3.1.4 B √ (1)

3.1.5 D √ (1)

3.1.6 G √ (1)

3.1.7 F √ (1)

3.2

3.2.1 If there is no gully and the sewerage system is blocked sewage will flow out through the bath outlet/shower outlet/water closet into the house. √ (1)

3.2.2 If there is a blockage in the sewerage system there will be no access to remove the blockage. √ (1)

3.3

• By using an electric geyser. √
• By using a gas geyser. √
• By using a solar geyser.
• By using fire to heat the water.
• Electricity
• Gas
• Wood/fire/donkey
• Heat pump

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.4

• Wind pump/mill √
• Hand pump
• A submersible pump
• Motorised/solar pump

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.5

• Shallow wells √
• Sea water (desalination)
• Rain water
• Dams
• Rivers
• Lakes
• Tanks/reservoirs/purchased water
• Recycled water

ANY ONE OF THE ABOVE
3.6

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE LAYOUT

\[\begin{align*}
3.7 & & \begin{align*}
3.7.1 & \text{Single-bowl sink} & \checkmark & (1) \\
3.7.2 & \text{Gully} & \checkmark & (1) \\
3.7.3 & \text{Water meter} & \checkmark & (1)
\end{align*} \\
3.8 & \begin{align*}
& \text{By using roof gutters rainwater will be channelled to an exit point.} & \checkmark & \\
& \text{By using surface channels leading rainwater to exit point.} & \checkmark & \\
& \text{By using hard surfaces rain water will be channelled to exit point.} & \\
& \text{By using grid-top manholes rain water will be channelled into the storm water pipe network.} & (2)
\end{align*} \\
3.9 & \begin{align*}
3.9.1 & \text{Conduits are chased into the wall.} & \checkmark & (1) \\
3.9.2 & \begin{align*}
& \text{A light switch/switch/isolator} & \checkmark \text{ OR} \\
& \text{Socket outlet/switched socket outlet/power point/plug.} & (1)
\end{align*} \\
3.9.3 & \begin{align*}
& \text{Socket outlet/Power point} & \checkmark & (1) \\
& \text{Distribution board/box/Prepaid meter} & \checkmark & (1) \\
& \text{Meter box} & \checkmark & (1)
\end{align*}
\end{align*}\]
3.9.4

- The kick pipe is used to protect the electrical cable from damage.
- To enable the installation of the electrical cable to the meter box.
- Easy replacement of electrical cables.
- Electricity supply to the building.
- Safety/neatness

3.9.5

[Diagram: W OR M]

(1)
**QUESTION 4 QUANTITIES AND CALCULATIONS AND JOINING**

<table>
<thead>
<tr>
<th>4.1</th>
<th>4.1.1</th>
<th>2 ( \sqrt{} )</th>
<th>(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1.2</td>
<td>114 mm ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.1.3</td>
<td>44 mm ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.1.4</td>
<td>Muntin ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.1.5</td>
<td>810 mm ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.1.6</td>
<td>32 mm ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.1.7</td>
<td>230 mm ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.2</th>
<th>4.2.1</th>
<th>C ( \sqrt{} )</th>
<th>(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2.2</td>
<td>B ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.2.3</td>
<td>D ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.2.4</td>
<td>A ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.2.5</td>
<td>D ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.2.6</td>
<td>D ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.2.7</td>
<td>A ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
<tr>
<td>4.2.8</td>
<td>A ( \sqrt{} )</td>
<td>(1)</td>
<td></td>
</tr>
</tbody>
</table>
### 4.3.1

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Internal measurements of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long walls = 5 240 ( \sqrt{\frac{2}{220}} ) mm ( \sqrt{\frac{2}{220}} ) = 4 800 mm ( \sqrt{\frac{2}{220}} )</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short walls = 4 040 ( \sqrt{\frac{2}{220}} ) mm ( \sqrt{\frac{2}{220}} ) = 3 600 mm ( \sqrt{\frac{2}{220}} )</td>
<td></td>
</tr>
<tr>
<td>1/</td>
<td>4.8 ( \sqrt{\frac{2}{220}} )</td>
<td></td>
<td>Internal area of the store room.</td>
</tr>
<tr>
<td>3.6 ( \sqrt{\frac{2}{220}} )</td>
<td>17.28 m( ^2 )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.3.2

1/ Number of ceiling boards.

| 2.4 \( \sqrt{\frac{2}{220}} \) | Area of one ceiling board (CB): |
| 0.9 \( \sqrt{\frac{2}{220}} \) | One ceiling board is 2 400 mm x 900 mm |
| 2.16 m\( ^2 \) | Area is 2.16 m\( ^2 \) |

### 4.3.3

Ceiling boards needed = \( \frac{\text{Area of room}}{\text{Area of CB}} \)

\[
= \frac{17.28}{2.16} = 8
\]

= 8 Ceiling boards are needed.
QUESTION 5: APPLIED MECHANICS

5.1
5.1.1 60 mm x 40 mm = 2 400 mm²

5.1.2 ½ x 20 x 30 mm = 300 mm²

5.1.3 80 mm x 30 mm = 2 400 mm²

5.1.4 2 400 mm + 2 400 mm − 300 mm = 4 500 mm²

5.1.5 40 mm

5.1.6 60 mm

5.1.7 60 mm

5.1.8 40 mm
5.2

SPACE DIAGRAM

VECTOR DIAGRAM
NOT ACCORDING TO SCALE
USE A MASK TO MARK THIS QUESTION

MEMBER | NATURE | MAGNITUDE
---|---|---
AF | Strut | 42.4 N
CE | Strut | 69.2 N

Tolerance of 1 N to either side.

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# 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>Closed eave/concealed eave</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>State the minimum pitch (slope) of number 1.</td>
<td>5° to 10°</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>State the standard dimension of number 2.</td>
<td>114 mm x 38 mm</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>State the centre-to-centre spacing between the brandering of the ceiling construction.</td>
<td>300 mm/400 mm/450 mm Any ONE of the above</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>State the purpose of number 3.</td>
<td>To cover the opening between the ceiling and the wall. To prevent unwanted elements entering the ceiling.</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Draw the drawing symbol for number 4.</td>
<td>![Drawing Symbol]</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>State the width of the external wall indicated by number 5, excluding plaster.</td>
<td>220 mm</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Name the colour coding that should be used for number 6.</td>
<td>Yellow</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>As a draughtsperson, recommend a type of roof sheeting for number 7.</td>
<td>Corrugated galvanised sheeting/IBR sheeting/Cement fibre sheet/Chromadeck/fibre glass Or any other acceptable answer</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Name ONE material that can be used for number 8.</td>
<td>Fibre cement, Knotty pine, chicken mesh and soffit laggings, soffit board, slats Any ONE of the above</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Identify number 9.</td>
<td>Quarter round mould/Quadrant</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>What is the standard dimension of number 10?</td>
<td>114 mm x 38 mm</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Draw a neat freehand line diagram of a kingpost roof truss.</td>
<td>![Kingpost Roof Truss]</td>
<td>3</td>
</tr>
</tbody>
</table>

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

ANSWER SHEET 6.2

NOT TO SCALE: USE A MASK TO MARK THIS QUESTION

---

<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>MARKS</th>
<th>LM</th>
</tr>
</thead>
<tbody>
<tr>
<td>External walls</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>NGL (correctly indicated)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>FFL (correctly indicated)</td>
<td>1</td>
<td>2</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 pipes</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Roof (correctly drawn)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Gutter</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

ASSESSMENT CRITERIA

- Application of scale
  - One or two incorrect = 3
  - Three or four incorrect = 2
  - More than five incorrect = 1
- No measurement correct = 0

TOTAL: 25