CIVIL TECHNOLOGY

MARKING GUIDELINES

Time: 3 hours

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.
QUESTION 1  CONSTRUCTION, SAFETY AND MATERIAL

1.1 To look after health and safety of workers in the building industry.  (2)

1.2 Five safety regulations.

1.2.1 Scaffold safety
   Pipes not painted
   Protruding ends covered
   setup on level ground
   Must have a footplate
   Only trained people can erect scaffolding
   No work on scaffold during bad weather
   Platforms able to carry load
   Safety harnesses when using scaffolding
   any FIVE or other acceptable answer  (5)

1.3 Column A and B

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3.1 Pollution</td>
<td>I contamination of air, soil or water</td>
</tr>
<tr>
<td>1.3.2 By-product</td>
<td>D product which is derived from the making of another product</td>
</tr>
<tr>
<td>1.3.3 Cutting list</td>
<td>E description and size of materials required to build a specific object</td>
</tr>
<tr>
<td>1.3.4 Excavations</td>
<td>A digging of trenches, holes, etc.</td>
</tr>
<tr>
<td>1.3.5 Cantilever</td>
<td>B an unsupported projecting beam at one end of the beam</td>
</tr>
<tr>
<td>1.3.6 Jointer</td>
<td>H a hand tool used in shaping the space between bricks</td>
</tr>
<tr>
<td>1.3.7 Angle grinder</td>
<td>J machine used in cutting materials</td>
</tr>
<tr>
<td>1.3.8 Symbols</td>
<td>K figure or sign that shows how different items and material can be indicated on a drawing</td>
</tr>
<tr>
<td>1.3.9 Servitude</td>
<td>C a restriction that prevents you from building in a specific area</td>
</tr>
</tbody>
</table>
1.4 SA truss (Howe Truss)

1.5 1st Aid electricity

- Remove electricity source, switch off, remove cable non-conductor
- Assess and treat for shock
- Not breathing or breathing laboured – start CPR
- Exercise caution as cables recoil
  - any other acceptable answer
QUESTION 2  ADVANCED CONSTRUCTION AND EQUIPMENT

2.1  2.1.1 Sketch rib and block suspended floor

Marks allocated:
Lintel – 1
Block – 1  Draw
Label lintel – 1
Label block – 1

Or any other acceptable sketch  (4)

2.1.2 Size of slab
   Load on floor
   Type of forces on floor
   Span
   Insulation characteristics needed
   Type of struts underneath
   any TWO or any other acceptable answer  (2)

2.2 Maintenance hand tools
   Clean and pack away after use
   Keep sharp and oiled
   Metal parts, resist touching with hands
   Pack away in secure sturdy container
   Use tool for specific purpose
   Sharp tools stored so that sharp parts not being damaged
   any FOUR or any other acceptable answer  (4)

2.3 Answer Booklet  (10)

2.4 Dumpy level

2.4.1 \[(2,250 - 1,750) \times 100\]
   \[= 50 \text{ m}\]  (2)

2.4.2

Vertical outside lines staff  \[1\]
Circle eyepiece  \[1\]
Top bottom stadia line  \[1\]
Horizontal hair  \[1\]
Height of C  \[1\]
\[3 \times 355 + 600\]
\[= 3,955 \text{ or } 3,955\]  (5)

2.4.3 Slope
\[3,355 - 2,550 = 805\]
RISE of 805 mm  OR  \[3,355 - 2,250\]
\[= 0,805 \text{ m}\]  (3)
2.5 Dry walls

2.5.1 Advantages:
- Relatively quick to install
- Different types of cladding can be used
- Can be painted
- Versatile as different size spaces can be erected
- Easily dissemble
- Dry process
- Placed in awkward spaces
- Cheaper

any TWO or other acceptable answer (2)

2.6 Arch

1. Extrado
2. Keystone/keybrick
3. Intrado
4. Abutment
5. Semi-circular gauged arch OR one brick gauged arch (5)

2.7 Pile foundations

1. Driven pile
2. Auger drill pile
3. Caisson pile foundation
4. Driven in situ pile

any THREE (3)

[40]
QUESTION 3  CIVIL SERVICES

3.1  3.1.1 Conservancy and Septic tank

**Conservancy tank**
- Cleaned regularly by pumping out sewage
- Connected to outlet valve
- Single chamber
- Sloped floor

*Any THREE or any other acceptable answer* (3)

**Septic tank**
- Connected to French drain
- 2 chambers
- Aperture
- Below ground construction
- Bacteria must be alive/no foreign objects

*Any THREE or any other acceptable answer* (3)

3.1.2 Uses

Conservancy – Close to municipality but no civil services pipe, truck must clean tank, airplanes
Septic – Far from any municipal area, far from town, no civil service pipes, soil runs into French drain. (2)

3.2 ANSWER BOOKLET (8)

3.3 ANSWER BOOKLET (14)
QUESTION 4 MATERIALS, QUANTITIES AND JOINING

4.1 Cure concrete
   Ponding
   Paint with curing agents
   Keep formwork in place
   Cover with damp material
   Spraying
   any THREE (3)

4.2 Window frame

   Material – Aluminum
   Reasons: Rust resistant
            Very light in weight
            Durable
   any TWO or other acceptable answer (3)

4.3 Roof truss

   4.3.1 By means of roof ties/anchor embedded four courses into super structure (1)

   4.3.2 Gang nails
       Nut and bolts (2)

   4.4.1 Area = 4,5 × 3,5 = 15,75 m²
       Ceiling board = 3,6 × 0,9 = 3,24 m²
       15,75 ÷ 3,24 = 4,86
       5 boards needed (4)

   4.4.2 Perimeter = 16 m
       16 ÷ 2,7 = 5,93
       = 6 lengths (3)

4.5 Fix to wall
   Anchors through extra wood
   Concrete/cut nails
   Anchors into wall through flat bracket
   Rest on cleat
   any TWO or other acceptable answer (2)

4.6 ANSWER BOOKLET (12) [30]
QUESTION 5  APPLIED MECHANICS

5.1 \((7 \,500 \times a) + (900 \times 50) = (6 \,000 \times 50) + (2 \,400 \times 153,33)\)

\[
7 \,500 \,a = 300 \,000 + 367 \,992 - 45 \,000 \\
= 83,07 \,mm = 622 \,992/7 \,500 \\
= 83,07 \,mm
\]  

(8)

5.2 Beam

5.2.1 \(P \times 9 = (4 \times 3) + (3 \times 6) + (6 \times 7,5) + (5 \times 9)\)

\[
9P = 12 + 18 + 45 + 45 \\
= 120/9 \\
P = 13,3 \,kN
\]

\(Q \times 9 = (5 \times 0) + (6 \times 1,5) + (3 \times 3) + (4 \times 6)\)

\[
9Q = 0 + 9 + 9 + 24 \\
= 42/9 \\
Q = 4,7 \,kN
\]

TEST

\[
13,3 + 4,7 = 5 + 6 + 3 + 4 \\
18 = 18
\]

(5)

5.2.2 Shear force diagram

SCALE 5 m = 1 kN

10 mm = 1 m

Correct calculation shown on diagram.  

(4)

5.2.3 Bending moment

\[BMb = (13,3 \times 3) - [(6 \times 1,5) + (5 \times 3)] = 39,9 - 24 = 15,9 \,kNm\]

(3)

5.3 ANSWER BOOKLET

QUESTION 6

6.1 ANSWER BOOKLET

6.2 ANSWER BOOKLET

Total: 200 marks