## SA's Leading Past Year

## Exam Paper Portal

## STUD.Y

# You have Downloaded, yet Another Great Resource to assist you with your Studies : 

Thank You for Supporting SA Exam Papers

Your Leading Past Year Exam Paper Resource Portal

Visit us @ www.saexampapers.co.za


> SAEAMM RADPERES


## basic education

Department: Basic Education REPUBLIC OF SOUTH AFRICA

## NATIONAL SENIOR CERTIFICATE

## GRADE 12

CIVIL TECHNOLOGY

## FEBRUARYIMARCH 2012

## MEMORANDUM

MARKS: 200

This memorandum consists of 17 pages.

## QUESTION 1 LO 3 AS 1, 2, 4, 5, 7, 10

1.1

|  | TERMINOLOGY |  | DESCRIPTION |
| :---: | :---: | :---: | :---: |
| 1.1.1 | Tripod | $J \checkmark$ | stand on which dumpy level is mounted |
| 1.1.2 | Gradient | H $\checkmark$ | angle or slope of fall for a sewerage system |
| 1.1.3 | Excavation | K $\checkmark$ | removal of soil to form a trench |
| 1.1.4 | Green building | A $\checkmark$ | environmentally friendly building built with environmentally friendly materials and systems |
| 1.1.5 | Pollution | $1 \checkmark$ | contamination of water, air or soil |
| 1.1 .6 | Aluminium | B $\checkmark$ | type of metal that will not rust |
| 1.1.7 | Perspex | L $\checkmark$ | can be used in the place of glass |
| 1.1.8 | Gypsum board | E $\checkmark$ | used as ceiling materials |
| 1.1.9 | Cement fibre | D $\checkmark$ | roof sheeting is made of this material |
| 1.1.10 | Formwork | G | temporary support for concrete when the concrete is being cast |

1.2 - Make a person lie in a comfortable position.

- Ensure that the air passage is open.
- Monitor pulse.
- The legs may be lifted 30 centimetres and the clothes should be loosened.
- Do not try to make the casualty sit or stand up.


## ANY FOUR OF THE ABOVE OR OTHER ACCEPTABLE ANSWERS

1.3.1
\&
1.3.2


| Correctness of: | Marks |
| :--- | :--- |
| SA roof truss | 2 |
| Fink roof truss | 2 |
| Any two labels | 2 |

1.4 - Type of roof covering. $\checkmark$

- Hard hat $\checkmark$
- No smoking $\checkmark$

Worn inside and outside buildings that are under construction $\checkmark$
Placed where flammable and explosives are stored $\checkmark$

- No pedestrians $\checkmark \quad$ Placed where construction is taking place and a danger to pedestrians $\checkmark$ Where walking is prohibited


## ANY OTHER ACCEPTABLE ANSWERS

1.6 - Long steel bolts are placed into wet concrete.

- Allow concrete to dry.
- Weld base plate to column/Drill holes in base plate. $\checkmark$
- At a later stage when the concrete is dry, the column fitted with a steel foot plate with holes is placed over the bolts.
- The column is then bolted firmly onto the concrete base.


## ANY THREE OF THE ABOVE OR OTHER ACCEPTABLE ANSWERS

## QUESTION 2 LO 3 AS 3, 4, 5, 7

2.1
2.1.1

A - steel helmet/cap.
$B$ - preformed concrete pile.
C - steel driving plate.
2.1.2 - Unstable or soft soil.

- On unstable soil or ground.
- Where the soil is loose.
- Non-cohesive soil.
- Where there is soil movement.
- Constantly wet areas.


## ANY ONE OF THE ABOVE OR OTHER ACCEPTABLE ANSWERS

- Bricks
- Tiles $\checkmark$
- Corrugated iron
- Concrete
- Asbestos - Fibre cement
- PVC
- Metals


## ANY TWO OF THE ABOVE OR OTHER ACCEPTABLE ANSWERS

2.3 BM - Benchmark

BS - Back sight $\checkmark$
2.4

| ASPECTS | IN SITU CONCRETE FLOOR <br> SLABS | BLOCK AND BEAM <br> FLOOR SLABS |
| :--- | :--- | :--- |
| Cost | Expensive $\quad$ Economical $\checkmark$ |  |
| Duration | Takes long to install $\checkmark$ | Quick to install $\checkmark$ |
| Formwork | Formwork needs to be erected $\checkmark$ | Formwork is not <br> required $\checkmark$ |
| Insulation | Poor insulation qualities | Good sound and <br> thermal insulation <br> Labour <br> Le skilled labour is <br> required to install |
| Skilled labour is required to erect | Lighter in weight |  |

ANY THREE FROM EACH CATEGORY OR OTHER ACCEPTABLE ANSWERS
2.5 - Increase the ability of the concrete to carry heavier loads. $\checkmark$

- The volume of concrete of a beam or column can now be reduced due to the extra strength of the steel.
- Increase the tensile strength of the concrete.

ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS
2.6 2.6.1 • Plastic spacers.

- Steel stands.
- Concrete blocks.


## ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS

2.6.2 - To prevent steel from rusting. $\checkmark$

- To protect the steel from excessive heat in case of fire.
- To protect the steel from deterioration when used in certain situations such as sea water.


## ANY ONE OR ANY OTHER ACCEPTABLE ANSWERS

2.7 2.7.1 Independent scaffold. $\checkmark$
2.7.2 - It prevents the vertical standards from sinking into the ground.

- It provides a level flat surface on which the scaffold is erected.
2.7.3 - Do not throw any tools or materials from a scaffold. $\checkmark$
- Never jump off a scaffold. $\checkmark$
- Never overload a scaffold.
- Remove or cover sharp edges or corners.
- Always attach free-standing scaffoldings to a building.

ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS
2.7.4 - It prevents workers from falling off the scaffold. $\checkmark$

- To prevent materials from falling off the scaffold.
- Used as a hand rail.
- It used to strap on safety harnesses.

ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS
$\begin{array}{ll}2.7 .5 & \text { To keep the scaffold steady. } \checkmark \\ & \text { - To brace the scaffold. } \checkmark \\ \text { OR ANY OTHER ACCEPTABLE ANSWERS }\end{array}$
2.7.6 - To prevent materials from falling off the scaffold.

- To prevent tools from falling off the scaffold.

OR ANY OTHER ACCEPTABLE ANSWERS

## QUESTION 3 LO 3 AS 5, 8

3.1 - Pipes and gas bottles must be checked regularly.

- Gas leaks must be checked using soap and water not open flames. $\checkmark$
- Close the shut-off valve when the system is not in use.
- Do not allow open flames near gas bottles.
- Ensure that the pilot flame trigger is in good working order.
- Refill gas bottles when empty, not when half full.
- Check and clean chimneys regularly. (Method: Test by warming the chimney with a blowlamp for five minutes. Light a smoke tablet and hold it at the bottom end of the chimney to see if it draws properly).

ANY FOUR OF THE ABOVE


FIGURE 3.2
NOTE: Other sketches showing the basic principles as indicated above will also be correct.

| CORRECTNESS OF DRAWING | MARK |
| :--- | :---: |
| Manhole cover | 1 |
| Concrete cover slab | 1 |
| Inflow | 1 |
| Waterproof cement plaster | 1 |
| Reinforced concrete floor slab | 1 |
| Outflow | 1 |
| Fall/Slope/Gradient | 1 |
| TOTAL FOR DRAWING | $\mathbf{7}$ |
| 1 mark for each of the above labels | $\mathbf{7}$ |
| GRAND TOTAL | $\mathbf{1 4}$ |

3.3 3.3.1 Sun $\checkmark$
3.3.2 Reduce/cut $\checkmark$
3.3.3 Hydro energy $\checkmark$
3.3.4 Waste products $\checkmark$

OR ANY OTHER ACCEPTABLE ANSWERS
3.4

| ADVANTAGES | DISADVANTAGES |
| :--- | :--- |
| Solar energy is reliable $\checkmark$ | The initial investment cost, although <br> falling, is still very high $\checkmark$ |
| Involves no moving parts $\checkmark$ | Very large areas of solar panels are <br> required to produce useful amounts <br> of electricity $\checkmark$ |
| Maintenance cost is very low | Generates only DC (direct current) |
| Solar energy operation is silent | Work only when sunlight is available |

## ANY TWO IN EACH CATEGORY

3.5 3.5.1 A Compression joint
B Capillary joint $\checkmark$

### 3.5.2 COMPRESSION JOINT

Quicker to assemble $\checkmark$
Can be easily dismantled

CAPILLARY JOINT
Cheaper $\checkmark$
Lighter than compression fittings

## OR ANY OTHER ACCEPTABLE ANSWERS

## QUESTION 4 LO 3 AS 2, 3, 7, 8

4.1
4.1.1
4.1.2

| A | B | C | D |
| :---: | :---: | :---: | :---: |
| 1/ | 9,11 |  | Area of building |
|  | $\underline{6,11}{ }^{\text {V }}$ | $\begin{equation*} \frac{55,66 \mathrm{~m}^{2}}{\checkmark} \tag{2} \end{equation*}$ |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  | Inside length of long walls |
|  |  |  | = 9,110-0,440 |
|  |  |  | $=8,67 \mathrm{~m} \checkmark$ |
|  |  |  |  |
|  |  |  |  |
| 2/ | 8,67 | 17,34 m | Length of skirting of long wall |
|  |  |  | = 17,340-0,900 |
|  |  |  | $=16,44 \mathrm{~m} \checkmark$ |
|  |  |  |  |
|  |  |  | Inside length of short walls |
|  |  |  | $=6,110-0,440$ |
|  |  |  | $=5,67 \mathrm{~m} \checkmark$ |
|  |  |  |  |
| 2/ | 5,67 | 11,34 m $\checkmark$ | Total length of skirting for short walls |
|  |  |  |  |
|  |  |  | Total length of skirting required |
|  |  |  |  |
|  |  | 16,44 | $=16,44+11,34$ |
|  |  | 11,34 | $=27,78 \mathrm{~m} \checkmark$ |
|  |  | 27,78 m | Therefore 27, 8 m of skirting is required. |
|  |  |  |  |
| 1/ | $\begin{gathered} 8,67 \\ 5,67 \\ \underline{0,075} \checkmark \end{gathered}$ | $3,69 \mathrm{~m}^{3} \checkmark$ | Volume of concrete for floor slab <br> Therefore $3,69 \mathrm{~m}^{3}$ of concrete is needed for the floor slab |
| 1/ | $\begin{gathered} 3,69 \\ \mathrm{R} 575,00 \\ \hline \end{gathered}$ | $\begin{gathered} \checkmark \\ \text { R2 } 121,75 \end{gathered}$ | Cost of concrete slab Therefore the cost of concrete is R2 121,75 |
|  |  |  |  |

4.1.4
4.1.3

OR
4.1.1 Area of building $=9,11 \mathrm{~m} \times 6,11 \mathrm{~m} \checkmark$

$$
\begin{equation*}
=55,66 \mathrm{~m}^{2} \checkmark \tag{2}
\end{equation*}
$$

$$
\text { 4.1.2 } \left.\begin{array}{rl}
\text { Inside measurements - long walls } & =9110 \mathrm{~mm}-440 \mathrm{~mm} \\
& =8670 \mathrm{~mm} \checkmark \\
& =2(8670 \mathrm{~mm})-900 \mathrm{~mm} \\
& =17340 \mathrm{~mm}-900 \mathrm{~mm} \\
& =16440 \mathrm{~mm} \\
\text { Length of skirting - long walls }
\end{array} \quad \begin{array}{rl} 
\\
\text { Inside measurements }- \text { short walls } & =6110 \mathrm{~mm}-440 \mathrm{~mm} \\
& =5670 \mathrm{~mm} \checkmark \\
& =5670 \mathrm{~mm} \mathrm{x}
\end{array}\right\}
$$

4.1.3 Volume of concrete for floor slab $=$ length $x$ breadth $\times$ depth

$$
\begin{align*}
& =8,67 \mathrm{~m} \times 5,67 \mathrm{~m} \times 0,075 \mathrm{~mm} \\
& =3,69 \mathrm{~m}^{3} \checkmark \tag{2}
\end{align*}
$$

4.1.4 Cost of concrete slab $=3,69 \mathrm{~m}^{3} \times$ R575,00 $\checkmark$

$$
\begin{equation*}
=\mathrm{R} 2121,75 \checkmark \tag{2}
\end{equation*}
$$

$$
\begin{equation*}
4.2 \tag{1}
\end{equation*}
$$

4.2.1 False $\checkmark$
4.2.2 True $\checkmark$
4.2.3 False $\checkmark$
4.2.4 False $\checkmark$
4.2.5 False $\checkmark$
4.2.6 True $\checkmark$
4.2.7 True $\checkmark$
4.3
4.3.1

- Particle board (chipboard) $\checkmark$
- Compressed fibre board (supawood) $\checkmark$
- Plywood
- Laminated board/melamine chip board
ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS


### 4.3.2 BOARD PRODUCTS

Available in large sheets $\checkmark$ More stable than solid timber

## SOLID TIMBER

Available in narrow widths $\checkmark$ Twists and warps if not seasoned properly

## OR ANY OTHER ACCEPTABLE ANSWERS

4.3.3 - The wood must be thoroughly sanded and dusted.

- Fill open grain and holes using wood filler that suits the wood.
- Seal the surface with sanding sealer.
- Rub down with fine sandpaper and dust off.
- Apply varnish with a soft brush or spray gun.
- Let dry and sand with fine sandpaper- smooth the wood, but don't remove the varnish.
- Apply the next coat of varnish - several coats may be applied, which must be sanded between coats.


## ANY FOUR OF THE ABOVE

$$
4.4
$$

4.4.1

- The mould must first be cleaned.
- Apply with mould oil or release oil on the inside.
4.4.2 - The concrete should be placed in the mould in layers of 50 mm each.
- Each layer should be tamped at least 45 times with a rounded tamping rod to get rid of all the air bubbles.
- The last layer should be filled higher than the top of the mould and then struck off with a steel float.
ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS


## QUESTION 5 LO 3 AS 5, 6

5.1 5.1.1 Distance of centroid of rectangle from A-A $=115 \mathrm{~mm} \quad \checkmark$
5.1.2 Distance of centroid of right angle triangle from $A-A=60 \mathrm{~mm} \checkmark$
5.1.3 Position of centroid $=(\mathrm{A} 1 \times \mathrm{d})+(\mathrm{A} 2 \times \mathrm{d})$

Total Area
$=\frac{(5000 \times 115)+(1350 \times 60)}{6350 \checkmark}$
$=\frac{575000+81000}{6350}$
$=\frac{656000 \mathrm{~mm}^{3}}{6350 \mathrm{~mm}^{2}}$ $6350 \mathrm{~mm}^{2}$
$=103,31 \mathrm{~mm} \checkmark \checkmark$
OR
Take moments about B left side
$6350 \mathrm{~mm}^{2} \times \mathrm{X}=(5000 \times 115)+(1350 \times 60)$

$$
\begin{aligned}
& =575000+81000 \\
& =\frac{656000 \mathrm{~mm}^{3}}{6350 \mathrm{~mm}^{2}}
\end{aligned}
$$

$$
=103,31 \mathrm{~mm} \checkmark \checkmark
$$

OR

|  | AREA <br> $(\mathrm{A})$ | X | Area of Y (Ay) |
| :--- | :--- | :--- | :--- |
| Rectangle | 5000 <br> $\checkmark$ | $\frac{\mathrm{~L}}{2}=\frac{50}{2}=25+90=115 \checkmark$ | $575000 \mathrm{~mm}^{2}$ |
| Triangle | +1350 <br> $\checkmark$ | $\frac{\mathrm{b}}{3}=\frac{90}{3}=30$ From right angle <br> $90-30=60 \checkmark$ <br> From A - A | $+81000 \mathrm{~mm}^{2}$ |
| $\Sigma$ | $6350 \checkmark$ |  | $656000 \mathrm{~mm}^{3}$ |

$$
\begin{align*}
& \frac{\sum A x}{\sum A} \\
= & \frac{656000 \mathrm{~mm}^{3}}{6350 \mathrm{~mm}^{2}} \\
= & 103,31 \mathrm{~mm} \checkmark \checkmark \tag{8}
\end{align*}
$$

$5.2 \quad 5.2 .1 \quad$ REFER TO ANSWER SHEET 5.2
5.2.2 REFER TO ANSWER SHEET 5.2
5.2.3 REFER TO ANSWER SHEET 5.2
5.3 Take moments around RL
$5 R R=(3 \mathrm{kN} \times 0 \mathrm{~m})+(4 \mathrm{kN} \times 1 \mathrm{~m})+(5 \mathrm{kN} \times 3 \mathrm{~m})+(4 \mathrm{kN} \times 4 \mathrm{~m}) \checkmark$ $=0 \mathrm{kNm}+4 \mathrm{kNm}+15 \mathrm{kNm}+16 \mathrm{kNm} \checkmark$

$$
\mathrm{RR}=\frac{35 \mathrm{kNm}}{5 \mathrm{~m} \checkmark}
$$

$$
\mathrm{RR}=7 \mathrm{kN} \checkmark \checkmark
$$

## QUESTION 6 LO 6 AS 4, 5, 7, 8

6.1 REFER TO ANSWER SHEET 6.1
6.2 REFER TO ANSWER SHEET 6.2

## QUESTION 2.8

## ANSWER SHEET 2.8



| DESCRIPTION | MARKS |
| :--- | :---: |
| Wall thickness measurement | 1 |
| Wall penetration measurement | 1 |
| Wall drawn and labelled | 1 |
| Concrete floor drawn and labelled | 1 |
| Reinforcing mesh drawn and labelled | 2 |
| Minimum concrete cover shown and labelled | 1 |
| Floor thickness measurement | 1 |
| Concrete symbol | 1 |
| Scale (Accuracy of drawing) | 1 |
| Total | $\mathbf{1 0}$ |

## QUESTION 5.2

## ANSWER SHEET 5.2



Space diagram
(1)


Force diagram
Scale $1 \mathrm{~mm}=1 \mathrm{~N}$

| MEMBER | NATURE | MAGNITUDE |
| :---: | :---: | :---: |
| BF | Strut $\checkmark$ | $34,6 \mathrm{~N}$ |
| CG | Strut | $75 \mathrm{~N} \checkmark$ |
| DG | Tie $\checkmark$ | $37,5 \mathrm{~N}$ |
| DE | Tie | $31,7 \mathrm{~N} \checkmark$ |

Allow a tolerance of 1 N on either side.

## QUESTION 6.1

## ANSWER SHEET 6.1

| No. | QUESTIONS | ANSWERS | MARKS |
| :--- | :--- | :--- | :---: |
| $\mathbf{1}$ | What is the scale of the drawing? | $1: 100$ | 1 |
| $\mathbf{2}$ | Identify number 1. | Ridge capping | 1 |
| $\mathbf{3}$ | Identify number 2. | Roof sheeting | 1 |
| $\mathbf{4}$ | Identify number 3. | Purlin | 1 |
| $\mathbf{5}$ | Identify number 4. | King post | 1 |
| $\mathbf{6}$ | Identify number 5. | Beam filling | 1 |
| $\mathbf{7}$ | What colour is used to indicate <br> new brickwork on a drawing? | Red | 1 |
| $\mathbf{8}$ | Identify number 6. | Gutter | 1 |
| $\mathbf{9}$ | Identify number 7. | Window | 1 |
| $\mathbf{1 0}$ | Identify number 8. | Window sill | 1 |
| $\mathbf{1 1}$ | Identify number 9. | Screed/Topping | 1 |
| $\mathbf{1 2}$ | Identify number 10. | Rainwater downpipe | 1 |
| $\mathbf{1 3}$ | Identify number 11. | Strip foundation | 1 |
| $\mathbf{1 4}$ | Identify number 12. | Natural ground level | 1 |
| $\mathbf{1 5}$ | Draw freehand the symbol for a <br> wash hand basin. |  | 1 |

## QUESTION 6.2

## ANSWER SHEET 6.2



SCALE 1 : 100

| CORRECTNESS AND ACCURACY OF: |  |
| :--- | :---: |
| Roof construction | 3 |
| Fascia boards | 1 |
| Gutters | 2 |
| Down pipe | 2 |
| Windows | 2 |
| Door | 1 |
| Step | 1 |
| Wall | 2 |
| Window sills | 2 |
| TOTAL |  |
| LABELS |  |
| Finished floor level | $\mathbf{1 6}$ |
| Natural ground level | 1 |
| Wall finishing | 1 |
| Roof pitch | 1 |
| Roof covering | 1 |
| Scale (print) | 1 |
| South elevation (print) | 1 |
| Total | 1 |
| Accuracy/Neatness | $\mathbf{7}$ |
| TOTAL | $\mathbf{2 5}$ |

Use a mask to mark this drawing.
Deduct 3 marks if wrong section was drawn.

