

**GAUTENG DEPARTMENT OF EDUCATION
SENIOR CERTIFICATE EXAMINATION
GAUTENGSE DEPARTEMENT VAN ONDERWYS
SENIORSERTIFIKAAT-EKSAMEN**

**FITTING AND TURNING SG
PAS- EN DRAAIWERK SG**

POSSIBLE ANSWERS OCT / NOV 2006

QUESTION 1/VRAAG 1

- | | | |
|------|------|-------------|
| 1.1 | B, D | |
| 1.2 | B | |
| 1.3 | A, C | |
| 1.4 | B, D | |
| 1.5 | C, D | |
| 1.6 | B, D | |
| 1.7 | A, C | |
| 1.8 | C | |
| 1.9 | C | (15) |
| 1.10 | F/O | |
| 1.11 | F/O | |
| 1.12 | F/O | |
| 1.13 | T/W | |
| 1.14 | T/W | (10) |
| | | [25] |

QUESTION 2/VRAAG 2

2.1

<p>Advantages:</p> <ol style="list-style-type: none"> 1. Optimal use of machines. 2. Lower equipment cost. <p>Disadvantages:</p> <ol style="list-style-type: none"> 1. Production not always continuous. 2. Damages to work due to excessive handling. 	<p>Voordele:</p> <ol style="list-style-type: none"> 1. Optimale gebruik van masjiene. 2. Laer toerustingkoste. <p>Nadele:</p> <ol style="list-style-type: none"> 1. Produksie nie altyd aaneenlopend nie. 2. Skade aan werk deur oormatige hantering.
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(4)

2.2.1



2.2.1

<ol style="list-style-type: none"> 1. Mount work in lathe chuck and turn down to 90 mm. 2. Drill pilot hole and bore to 70 mm. 3. Set machine for left hand cutting and set compound slide parallel. 4. Cut recess on left side to root diameter wide enough for threading tool. 	<ol style="list-style-type: none"> 1. Monteer werk op draaibank en draai af tot 90 mm. 2. Boor loodsgat en boor uit tot 70 mm. 3. Stel masjien vir linkerhandse snywerk en stel saamgestelde slee parallel. 4. Sny reses op linkerkant tot worteldiameter wyd genoeg vir snybeitel.
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|---|---|
| <ol style="list-style-type: none"> 5. Grind tool to correct width (4 mm). 6. Bring tool to touch work and set dial on 0. 7. Take tool to start of thread (opposite recess). 8. Move the dial inward 0,6 mm, take light cut and recheck pitch, etc. 9. Continue to take cuts until full depth is reached. 10. Take final cut 0,25 mm deeper for some play. | <ol style="list-style-type: none"> 5. <i>Slyp beitel tot korrekte wydte (4 mm).</i> 6. <i>Bring beitel om werk te raak en stel kraag op 0.</i> 7. <i>Bring beitel tot begin van draad (teenoor reses).</i> 8. <i>Beweeg kraag inwaarts 0,6 mm, neem ligte snit en gaan steek, ens. na.</i> 9. <i>Neem verdere snitte tot voldiepte.</i> 10. <i>Neem finale snit 0,25 mm dieper vir speling.</i> |
|---|---|

(10)

2.3

2.3.1

Indexing/Indeksering = $40/N$
 = $40/28$
 = $1 + 12/28$
 = One full turn plus 12 holes
 on 28 hole circle/Een volle draai plus 12 gate op die 28-gat-sirkel.

(3)

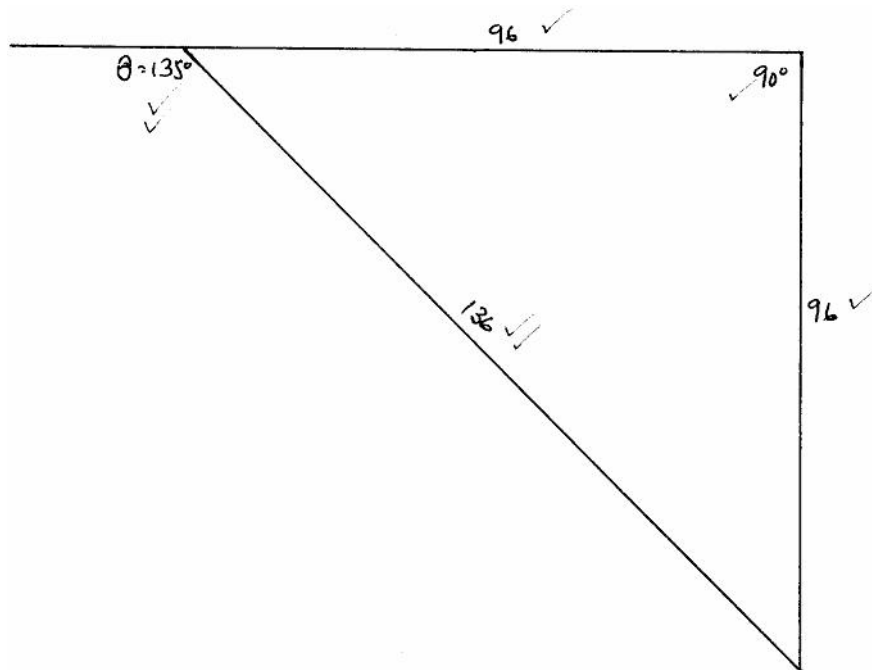
2.3.2

Indexing/Indeksering = $?/9$ or/of $?/540$
 = $16^{\circ} 40'$
 540
 = $\frac{1\ 000}{540}$
 = $1 + 460/540$
 = 1 Full turn plus 46 holes
 on the 54 hole circle/Een volle draai plus 46 gate op die 54-gat-sirkel.

(4)

2.4

M	D/A	M/D	Scale/Skaal
12	400	4 800P	96P
16	300	4 800P	96P
12	566,7P	6 800P	136P



(14)

[35]

QUESTION 3/VR AAG 3

3.1

<p>3.1.1 $PCD = T_{mw}$ $= 48 \times 2,684$ $= 128,832 \text{ mm}$</p> <p>3.1.2 $mn = mw \cos 34^\circ$ $= 2,684 \times 0,829$ $= 2,225 \text{ mm}$</p> <p>OD/BD = $PCD/SSD \times 2 \times mn$ $= 128,832 \times 2 \times 2,225$ $= 573,338 \text{ mm}$</p> <p>3.1.3 $No. = T / (\cos 34^\circ)^3$ $= \frac{48}{(0,829)^3}$ $= 84,24$ Say/Se 84 teeth/tande</p>	<p>3.1.4 $l = \frac{p \times PCD/SSD}{\tan 34}$ $= \frac{p \times 128,832}{0,675}$ $= \frac{404,738}{0,675}$ $= 600 \text{ mm}$</p> <p>3.1.5 $L = 40 \times 6$ $= 240 \text{ mm}$</p> <p>3.1.6 Change gears/Wisselratte = $\frac{D_r}{D_n} = \frac{L}{1}$ $= \frac{240}{600}$ $= 28 \text{ or/of } 40$ $70 \quad 100$ Driver/Dryfrat = 28 teeth/tande Driven /Gedrewe = 70 teeth/tande</p>
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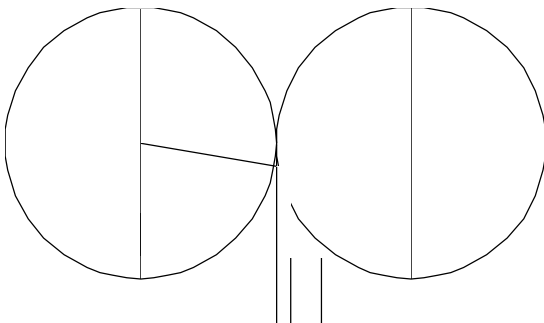
(19)

3.2

<p>$P = F/A$ $A = F \div P$ $= \frac{200\,000}{500\,000\,000}$ $= 0,0004 \text{ m}^2$</p>	<p>But $A = \frac{p \times d^2}{4}$ $d = \sqrt{\frac{A \times 4}{p}}$ $= \sqrt{\frac{0,0004 \times 4}{p}}$ $= \sqrt{0,000509295}$ $= 0,022\,567583 \text{ m}$ $= 22,568 \text{ mm}$</p>
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(7)

3.3.1



3.3.2

$$\begin{aligned}
 \text{Set over/Oorstelling} &= R \sin ? \\
 &= 75 \times \sin 7^\circ \\
 &= 75 \times 0,12186 \\
 &= 9,14 \text{ mm}
 \end{aligned}$$

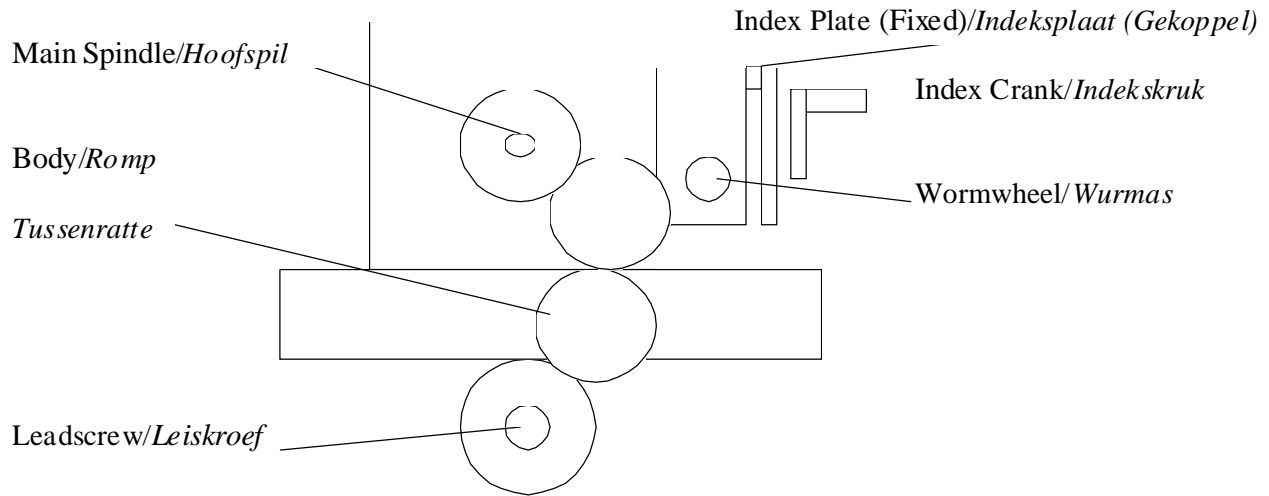
(3)

(6)

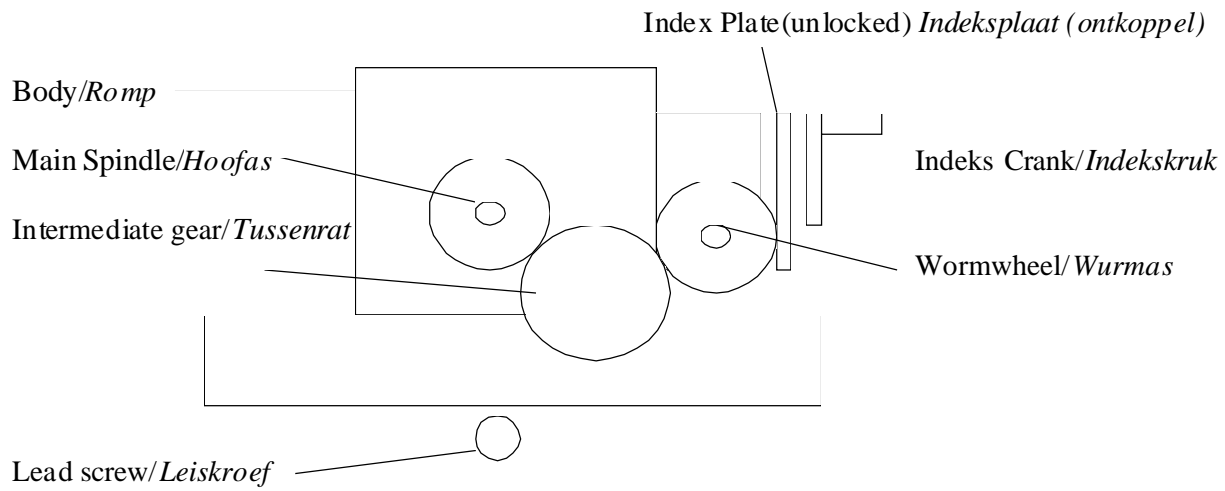
[35]

QUESTION 4/VRAAG 4

4.1.1

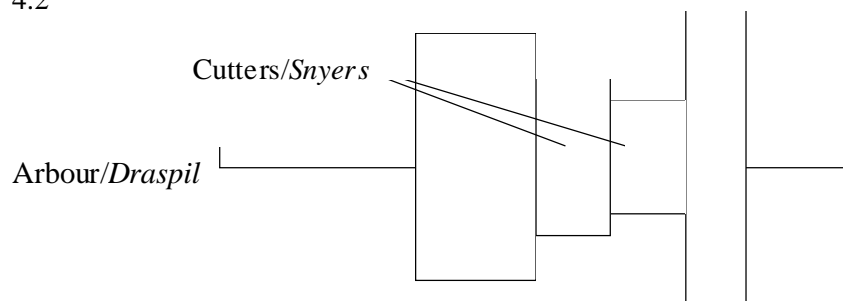


4.1.2



(12)

4.2



<p>4.2.1</p> <ol style="list-style-type: none"> The cutters are set up on the arbour as indicated on the sketch, with no collars between them. Care must be taken to allow space between the cutters and the work when full depth is reached. A single cut can be taken, depending on the material used. 	<p>4.2.1</p> <ol style="list-style-type: none"> Die snyers word op die draspil opgestel soos op die skets aangedui, sonder krae tussen hulle. Daar moet sorg gedra word om spasie te laat tussen die snyers en die werk wanneer voldiepte bereik word. ? Enkele snit kan geneem word, afhangende van die materiaal wat gebruik word.
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(6)

4.2.2

Gang milling/Groeprees

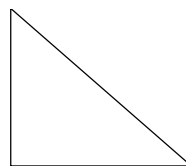
(2)

4.3

$$\begin{aligned} \text{Radius} &= 145 + \text{Diam.} \\ &= 145 + 12 \\ &= 157 \text{ mm} \end{aligned}$$

$$\begin{aligned} \text{PCD/SSD} &= 2 \times 157 \\ &= 314 \text{ mm} \quad (4) \end{aligned}$$

4.3.2



$$\begin{aligned} \sin 67\frac{1}{2}^\circ &= \frac{Y}{157} \\ Y &= 157 \times \sin 67\frac{1}{2}^\circ \\ Y &= 157 \times 0,9238795 \\ &= 145,049 \text{ mm} \\ \text{Dist. between buttons/Afs. tussen knoppies} &= (2 \times 145,049) - 12 \\ &= 290,098 - 12 \\ &= 278,098 \text{ mm} \quad (9) \end{aligned}$$

4.3.3

Isosceles triangle/Gelykbenige driehoek

(2)

[35]

QUESTION 5/VRAAG 5

<p>5.1.1</p> <p>In $\triangle CDE$</p> <p>DE = 100 [Given/Gegee]</p> <p>CD = $52,057 \left[\frac{267-162,886}{2} \right]$</p> <p>Tan C = $100/52,057$</p> <p>= 1,92097</p> <p>C = $62,5^\circ$</p> <p>? = $180^\circ - (2 \times 62,5^\circ)$</p> <p>= $180^\circ - 125^\circ$</p> <p>= 55°</p>	<p>5.1.2</p> <p>In $\triangle ABC$</p> <p>BC = 10</p> <p>A = $31,5^\circ$ [62,5 / 2]</p> <p>Tan $31,5^\circ = 10/AB$</p> <p>AB = $\frac{10}{\tan 31,5^\circ}$</p> <p>= $16,47948$</p> <p>= 16,479 mm</p> <p>Small D/Klein D = $162,886 - 2AB - 20$</p> <p>= $162,886 - 32,959 - 20$</p> <p>= 109,927 mm</p>
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(8)

(9)

5.2 Any 4

<ol style="list-style-type: none"> 1. Handling of materials minimised. 2. Production is faster. 3. Work more accurate. 4. Changes in design easily affected. 5. Punchbands easy and fast to prepare. 6. Unskilled labour can be used. 	<ol style="list-style-type: none"> 1. <i>Materiaal word minimaal hanteer.</i> 2. <i>Produksie is vinniger,</i> 3. <i>Werk meer akkuraat.</i> 4. <i>Veranderinge in ontwerp word maklik geïmplementeer.</i> 5. <i>Ponsbande is maklik en vinnig om voor te berei.</i> 6. <i>Ongeskoolde arbeid kan gebruik word.</i>
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(4)

5.3

<ol style="list-style-type: none"> 1. It leaves a burr that must be removed with an oilstone. 2. Teeth can easily overheat and burn. 	<ol style="list-style-type: none"> 1. <i>Dit laat ? baard wat met ? slypsteen verwyder moet word.</i> 2. <i>Tande kan maklik oorverhit en brand.</i>
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(2)

5.4

$F = 10000 \times 10 = 100\,000 \text{ N}$ $d = F/A$ $A = F/d$ $= \frac{100\,000}{12\,000\,000}$ $= 0,00833 \text{ m}$ $A_p = 0,00833/5$ $= 0,0016667 \text{ m}^2$	But/Maar $A = \frac{p \times d^2}{4}$ $d = \frac{\sqrt{A \times 4}}{p}$ $= \frac{\sqrt{0,001667 \times 4}}{p}$ $= \sqrt{0,002122}$ $= 0,046065886 \text{ m}$ $= 46,066 \text{ mm}$
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(9)

5.5 Any 2/Enige 2

<ol style="list-style-type: none"> 1. A better finish is obtained. 2. Very little shock on teeth. 3. Teeth remain sharp for longer because the teeth do not get into contact with the hard scale on the metal surface. 	<ol style="list-style-type: none"> 1. <i>? Beter afwerking word verkry.</i> 2. <i>Baie min skok op die tande.</i> 3. <i>Tande bly langer skerp, omdat dit nie in aanraking met die harde skaal op die metaaloppervlak kom nie.</i>
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(2)

5.6 Any 1 / Enige 1

<ol style="list-style-type: none"> 1. Teeth get blunt quicker due to the hard scale. 2. Teeth tend to climb because of back lash. 	<ol style="list-style-type: none"> 1. <i>Tande word gouer stomp a.g.v. die harde skaal.</i> 2. <i>Tande neig om oor te klim a.g.v. dooiegang.</i>
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(1)

[35]

QUESTION 6/VRAAG 6

6.1

6.1.1 $P = F/A$ $= \frac{500 \times 4}{p \times 0,05^2}$ $= \frac{2\,000}{0,00785}$ $= 254\,647,9089 \text{ Pa}$ $= 254,648 \text{ kPa}$	6.1.2 $P_1 = P_2$ $F_1 A_1 = F_2 A_2$ $\frac{500}{d^2} = \frac{F_2}{D^2}$ $F_2 d^2 = 500 D^2$ $F_2 = \frac{500 \times D^2}{d^2}$ $F_2 = \frac{500 \times 150^2}{50^2}$ $= 4\,500 \text{ N}$
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(5)

(8)

6.2

<p>Lead/<i>Styging</i> = 6×2 = 12 mm</p> <p>$D_m = OD/BD - p/2$ = $65,5 - 6/2$ = $65,5 - 3$ = 62,5 mm</p> <p>6.2.2</p> <p>$\tan ? = L / pD_m$ = $\frac{12}{p \times 62,5}$ = $\frac{12}{196,34954}$? = $\tan 0,061115498$? = $3,497^\circ$? = $3,5^\circ$</p>	<p>6.2.1</p> <p>Leading angle/<i>Ingryphoek</i> = $90^\circ - (3,5^\circ + 3^\circ)$ = $90^\circ - 6,5^\circ$ = $83,5^\circ$</p> <p>6.1.2</p> <p>Following angle/<i>Nasleephoek</i> = $90^\circ + (3,5^\circ - 3^\circ)$ = $90^\circ + 0,5^\circ$ = $90,5^\circ$</p> <p>6.2.3</p> <p>Cutting depth/<i>Snydiepte</i> = Pitch/<i>Steek</i> $\frac{2}{6/2}$ = 3 mm</p>
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(13)

6.3 Any 3/*Enige 3*

<p>Unbalanced work may cause</p> <ol style="list-style-type: none"> unnecessary bearing loads. excessive vibration. bad finish. chatter on gear teeth. the work not to be perfectly round. the main spindle to bend. danger to the operator. 	<p><i>Ongebalanseerde werk veroorsaak</i></p> <ol style="list-style-type: none"> <i>onnodige laerbelasting.</i> <i>oormatige vibrasies.</i> <i>swak afwerking.</i> <i>kletter op rattande.</i> <i>dat die werk nie perfek rond is nie.</i> <i>dat die hoofspil buig.</i> <i>gevaar vir die operateur.</i>
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(3)

6.4

$$\begin{aligned}
 mn &= mw \cos ? \\
 &= 6,59 \times \cos 24^\circ 27' \\
 &= 6,59 \times 0,910322812 \\
 &= 5,999 \\
 &= 6 \text{ mm}
 \end{aligned}$$

$$\begin{aligned}
 \text{Cutting depth/Snydiepte} &= 2,157 \times mn \\
 &= 2,157 \times 6 \\
 &= 12,942 \text{ mm}
 \end{aligned}$$

(6)
[35]**TOTAL / TOTAAL: 200**