Province of the
EASTERN CAPE
EDUCATION

DIRECTORATE SENIOR CURRICULUM MANAGEMENT (SEN-FET)

HOME SCHOOLING SELF-STUDY WORKSHEET ANSWER SHEET

SUBJECT	FITTING AND MACHINING	**GRADE**	12	**DATE**	JUNE 2020
TOPIC	JOINING METHODS	**TERM 1 REVISION**	(Please tick)	**TERM 2 CONTENT**	(√)

QUESTION 1 Calculations on square threads:

1.1 The pitch diameter:

Lead = Pitch x number of starts

$$P = \frac{\text{Lead}}{\text{Number of starts}}$$
$$= \frac{30}{3}$$
$$= 10 \text{ mm}$$

$$\text{Pitch diameter} = OD - \left(\frac{P}{2}\right)$$
$$= 75 - \left(\frac{10}{2}\right)$$
$$= 70 \text{ mm}$$

1.2 The helix angle of the thread:

$$\text{Helix angle } \tan\theta = \frac{\text{lead}}{\pi \times \text{pitch diameter}}$$

$$= \frac{30}{\pi \times 70}$$

$$\theta = 7{,}77°$$

$$\theta = 7°46'$$

1.3 The leading tool angle:

$$\text{Leading tool angle} = 90° - (\text{helix} + \text{clearance angle})$$

$$= 90° - (7°46' + 3°)$$

$$= 79°14'$$

1.4 The following tool angle:

$$\text{Following tool angle} = 90° + (\text{helix} - \text{clearance angle})$$

$$= 90° + (7°46' - 3°)$$

$$= 94°46'$$

QUESTION 2 Square Thread Calculations:

2.1 Helix

$$\text{Helix (Tan } \theta) = \frac{Lead}{\pi D}$$
$$= 45 / (\pi \times 84)$$
$$\text{Tan } \theta = 0{,}17$$
$$\Theta = 9{,}677°$$

2.2 Leading Tool Angle

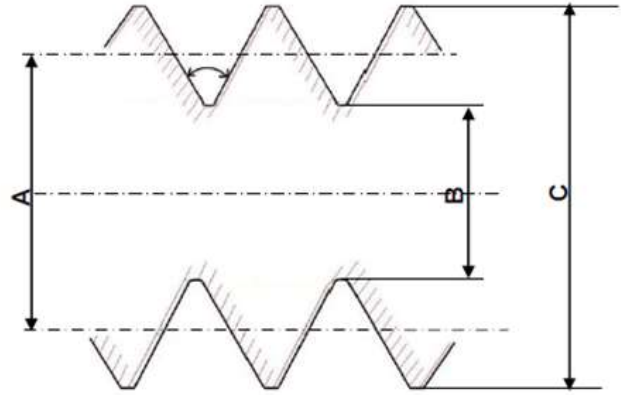
Leading Tool Angle = 90 – (Helix + Clearance)
= 90 – (9,677 – 3.)
= 77,323°

2.3 Trailing/Following tool angle

Trailing/Following tool angle = 90 + (Helix – Clearance)
= 90 + (9,677 – 3) ✓
= 96,677° ✓

QUESTION 3

3.1 Screw thread diameters:



A = Pitch diameter/Effective diameter ✓
B = Minor diameter/Root diameter ✓
C = Major diameter/Crest diameter/Outside diameter/Nominal diameter/Basic diameter ✓

3.2 **Lead of a screw thread:**

The lead is the distance a thread will move axially in one full revolution.

3.3 **Square screw thread:**

3.3.1 Screw thread lead:

Lead = pitch x number of starts

= 4 x 3

= 12 mm

3.3.2 Mean/pitch circumference:

$$\text{Mean/pitch circumference} = \pi\left(OD - \frac{P}{2}\right)$$
$$= \pi\left(68 - \frac{4}{2}\right)$$
$$= 207{,}35 \text{ mm}$$

3.3.3 Helix angle:

$$\text{Helix angle } \tan\theta = \frac{\text{lead}}{\text{mean/pitch circumference}}$$
$$= \frac{12}{207{,}35} \quad \checkmark$$
$$\theta = 3{,}31° \quad \checkmark$$

3.3.4 Leading angle:

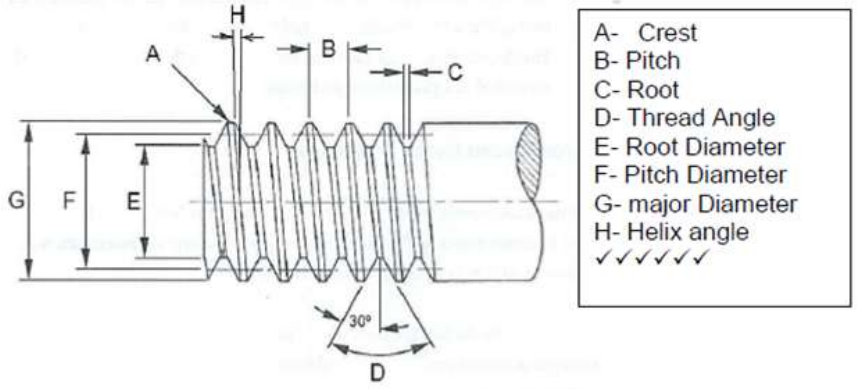
$$\text{Leading tool angle} = 90° - (\text{helix angle} + \text{clearance angle})$$
$$= 90° - (3{,}31° + 3°) \quad ✓$$
$$= 83{,}69° \quad ✓$$

3.3.5 Following angle:

$$\text{Following tool angle} = 90° + (\text{helix angle} - \text{clearance angle})$$
$$= 90° + (3{,}31° - 3°) \quad ✓$$
$$= 90{,}31° \quad ✓$$

QUESTION 4 Screw thread:

4.1 Screw thread profile



A- Crest
B- Pitch
C- Root
D- Thread Angle
E- Root Diameter
F- Pitch Diameter
G- major Diameter
H- Helix angle
✓✓✓✓✓✓

QUESTION 5 Measurements of a screw thread:

5.1 Metric screw thread

5.2 Crest diameter / Outside diameter

5.3 Pitch.

QUESTION 6 Angles of a square thread cutting tool:

6.1 A = Helix angle

6.2 B = Leading tool angle

6.3 C = Following tool angle

QUESTION 7 Units Conversion:

40,125º

40,125 – 40 = 0,125

0,125 x 60 = 7,5

= 40º 7’30’’