





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

$$P = \frac{\text{Lead}}{\text{Number of starts}}$$

$$= \frac{30}{3}$$

$$= 10 \text{ mm}$$

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

$$= 75 - \left(\frac{10}{2} \right)$$

$$= 70 \text{ mm}$$

1.2 The helix angle of the thread:

$$\begin{aligned}\text{Helix angle } \tan \theta &= \frac{\text{lead}}{\pi \times \text{pitch diameter}} \\ &= \frac{30}{\pi \times 70} \\ \theta &= 7.77^\circ \\ \theta &= 7^\circ 46'\end{aligned}$$

1.3 The leading tool angle:

$$\begin{aligned}\text{Leading tool angle} &= 90^\circ - (\text{helix} + \text{clearance angle}) \\ &= 90^\circ - (7^\circ 46' + 3^\circ) \\ &= 79^\circ 14'\end{aligned}$$

1.4 The following tool angle:

$$\begin{aligned}\text{Following tool angle} &= 90^\circ + (\text{helix} - \text{clearance angle}) \\ &= 90^\circ + (7^\circ 46' - 3^\circ) \\ &= 94^\circ 46'\end{aligned}$$

QUESTION 2 Square Thread Calculations:

2.1 Helix

$$\begin{aligned}\text{Helix (Tan } \theta) &= \frac{\text{Lead}}{\pi D} \\ &= 45 / (\pi \times 84) \\ \text{Tan } \theta &= 0,17 \\ \theta &= 9,677^\circ\end{aligned}$$

2.2 Leading Tool Angle

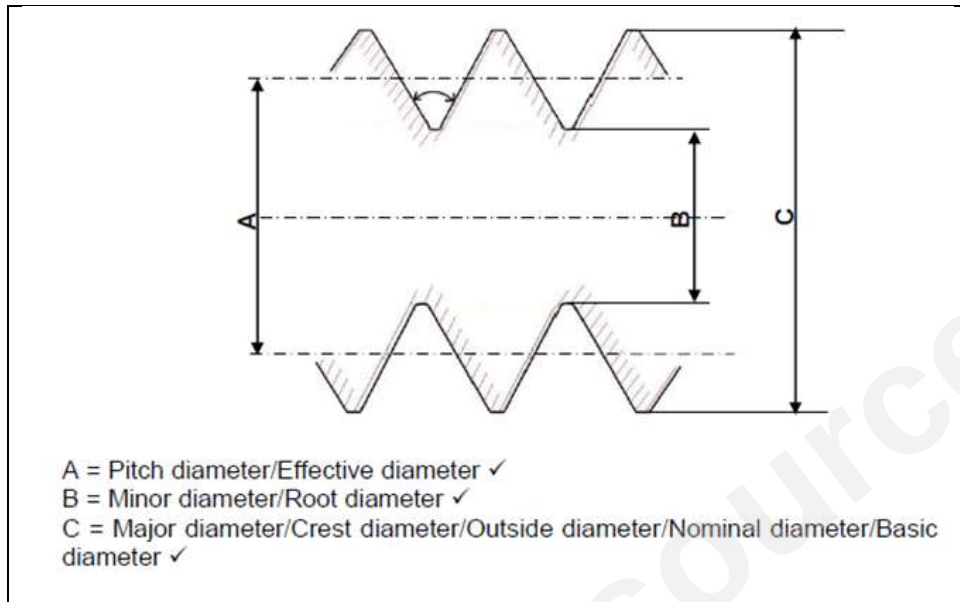
$$\begin{aligned}\text{Leading Tool Angle} &= 90 - (\text{Helix} + \text{Clearance}) \\ &= 90 - (9,677 - 3.) \\ &= 77,323^\circ\end{aligned}$$

2.3 Trailing/Following tool angle

$$\begin{aligned}\text{Trailing/Following tool angle} &= 90 + (\text{Helix} - \text{Clearance}) \\ &= 90 + (9,677 - 3) \checkmark \\ &= 96,677^\circ \checkmark\end{aligned}$$

QUESTION 3

3.1 Screw thread diameters:



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

$$= 4 \times 3$$

$$= 12 \text{ mm}$$

3.3.2 Mean/pitch circumference:

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

3.3.3 Helix angle:

$$\begin{aligned} \text{Helix angle } \tan \theta &= \frac{\text{lead}}{\text{mean/pitch circumference}} \\ &= \frac{12}{207,35} \quad \checkmark \\ \theta &= 3,31^\circ \quad \checkmark \end{aligned}$$

3.3.4 Leading angle:

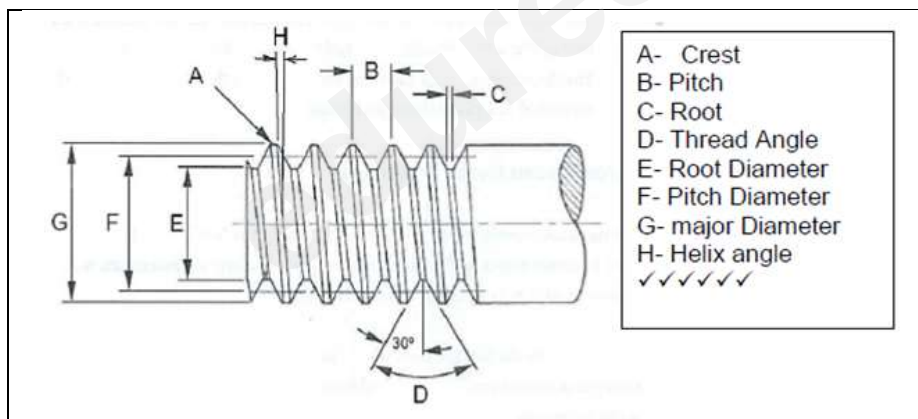
$$\begin{aligned}\text{Leading tool angle} &= 90^\circ - (\text{helix angle} + \text{clearance angle}) \\ &= 90^\circ - (3,31^\circ + 3^\circ) \quad \checkmark \\ &= 83,69^\circ \quad \checkmark\end{aligned}$$

3.3.5 Following angle:

$$\begin{aligned}\text{Following tool angle} &= 90^\circ + (\text{helix angle} - \text{clearance angle}) \\ &= 90^\circ + (3,31^\circ - 3^\circ) \quad \checkmark \\ &= 90,31^\circ \quad \checkmark\end{aligned}$$

QUESTION 4 Screw thread:

4.1 Screw thread profile



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:

40,125°

40,125 – 40 = 0,125

0,125 x 60 = 7,5

= 40° 7'30"