NATURAL SCIENCE MARKING GUIDELINES

April 2011
FITTING AND MACHINING THEORY N1
11021871

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PAS- EN MASJINEERTEORIE N1
SECTION A: GENERAL PRACTICE

QUESTION 1: OCCUPATIONAL SAFETY

1.1
1.1.1 Air
1.1.2 Acids
1.1.3 Fire fighting
1.1.4 Walkways
1.1.5 Alkalis

OR

1.2
1.2.1 At each change room.
1.2.2 Complaints on safety or health conditions
1.2.3 Competent person appointed by the manager on a daily basis.

QUESTION 2: MEASURING INSTRUMENTS

2.1

A. Anvil
B. Spindle
C. Barrel
D. Thimble
E. Ratchet
2.3
1. Measure the gap in piston rings.
2. Setting the gap on spark plugs.
3. Setting a flat work piece parallel to the movement of the shaper ram.
4. Testing clearance between machine slides.
5. Testing clearance on taper roller bearings.

(ANY TWO FACTS)

QUESTION 3: SCREW THREADS

3. 3.1 False
    3.2 False
    3.3 False
    3.4 True
    3.5 False
    3.6 False

QUESTION 4: METALS AND PLASTICS

4.1
4.1.1 Hardening ~ it produces a hard wearing resistant part.
4.1.2 Annealing ~ it softens the metal and makes it suitable for bending, drawing or other cold working operations.
4.1.3 Normalizing ~ refinements the structure of steel and removes strains caused by cold working.
4.1.4 Tempering ~ this reduces brittleness caused by hardening and increases toughness.
4.1.5 Case ~ hardening ~ to give the metal a hard outer skin for wearing and a soft inner core to handle shock loads.

4.2
4.2.1 Brass - copper and zinc
    Use - wire, rods, tubes, water fittings
4.2.2 Bronze - copper and tin
    Use - gears, valves, machine bearings

4.3 Tufnol
    Nylon
4.4 Colour coding is important so that we can identify the different metals.

QUESTION 5: MARKING OFF

5.1 1. It is used to find the centre of a shaft.
     2. Used to scribe a line parallel to the reference face of a work piece.

5.2 5.2.1 White wash or chalk and water.
     5.2.2 Copper sulphate or marking blue.

5.3 To scribe lines parallel to the reference surface on work piece.

QUESTION 6: KEY AND KEYWAYS

6.1 1. Rectangular key
     2. Taper gibhead key
     3. Feather key
     4. Woodruff key

6.2 R.T.C \[ \begin{align*}
H & = \frac{d}{6} = \frac{30}{5} = 5 \text{ mm} \\
W & = \frac{d}{4} = \frac{30}{4} = 7.5 \text{ mm}
\end{align*} \]

QUESTION 7: HAND TOOLS

7.1 1. Rivet the ends of rivets and pins
     2. Shape hollow objects
        (ANY ONE FACT)

7.2 1. Centre punch
     2. Dotting punch
     3. Pin punch
     4. Hollow punch
     5. Bell Punch (ANY THREE FACTS)
7.3 1. When you finish using the hacksaw, wipe it clean
2. Before you put the hacksaw away, loosen the tensioning wing in the blade.
3. Do not store the hacksaw in the tool box with other tools on top of it.

(ANY TWO FACTS)

 QUESTION 8: FASTENERS

8.1
1. Positive locking nuts are physically prevented from getting loose. (1)
2. Frictional locking nuts are held in place by friction only. (1)

8.2
1. Thread cutting screw
2. Self tapping screw
3. Drive screw

(ANY TWO FACTS)

 QUESTION 9: HAND TAPS; STOCKS AND DIES AND REAMERS

9.1
1. Tap extractor – this tool fits into the flutes of a tap, pushes against the thread of the surrounding material and forces the tap upward.
2. Dull cape chisels – place the chisel in a flute of the tap against the side of the cutting edge and strike the chisel lightly with a hammer.
3. Penetrating oil – this oil flows between the surrounding materials and the tap and creates a small clearance between the two components.
4. Nitric acid – drop a small amount of nitric acid into the hole, the acid will eat the steel and loosen the tap.

(ANY TWO FACTS)

9.2
The function of a reamer is to smooth the inside surface of drilled holes or to shape and enlarge holes.

9.3
1. Circular split die
2. Two – piece rectangular die
3. Solid die

(ANY TWO FACTS)
SECTION B

MACHINE CUTTING TOOLS AND MACHINES

QUESTION 10: DRILLING MACHINES

10.1

10.1.1 Spindle ~ it gives driving motion to the cutting tools or to hold the cutting tool in position.

10.1.2 Table ~ to clamp or hold a work piece to be drilled in position.

10.1.3 Chuck ~ to hold the cutting tool in position.

10.2

1. An improperly ground point.
2. When the feed is too heavy.
3. Lands that are being worn away cause the drill to blind in the hole.
4. The drill is clogged with chips causing fracture.
5. An incorrectly ground or blunt drill point.
6. When the feed is too rapid or incorrect.
7. When insufficient coolant is being used.
   (ANY FOUR FACTS)

10.3

\[
D = 12 \text{ mm} = 0,012 \text{ m} \\
S = 30 \text{ m/min} = 30 \frac{\text{m}}{60} = 0,5 \text{ m/sec}
\]

\[
S = \pi DN \\
N = \frac{S}{\pi D} \frac{\text{m}}{\text{sec}} = 0,5 \frac{\text{m}}{\text{sec}} \pi \times 0,012 \frac{\text{r}}{\text{sec}} \\
N = 13,263 \frac{\text{r}}{\text{sec}}
\]

QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS

11.1

1. They tend to cushion flanges against high point or uneven surfaces and distribute the pressure evenly.
2. The compressible washers prevent damage to the surface of the flange from the abrasive surface of the wheel.
3. They provide better control of friction between the flange and the wheel, thereby providing power to the wheel.
   (ANY TWO FACTS)

11.2

The nut will tend to tighten as the spindle revolves.
11.3
11.3.1 Trueing means getting an out of shape wheel to be perfectly round again.
11.3.2 Dressing means to sharpen a blunt wheel, it improves the wheel's cutting action.

11.4
11.5
Parting off tool

A Round – nose roughing tool
B Grooving tool
C Finishing tool
D Thread cutting tool

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QUESTION 12: SHAPING MACHINE

12.1
A Ram
B Tool holder
C Clapper box
D Tool head
E Protractor scale

12.2
Width = 160 mm
Length of stroke = 320 mm
Cutting speed = 12 m per stroke
Feed for rough cut = 3 mm per minute
Feed for finishing cut = 1.2 mm per minute
Stroke ratio = 2 : 1
Finishing cut time = 4 minutes 48 seconds
Setting up time = 10 minutes

12.2.1 Strokes per minute = \( \frac{\text{cutting speed (m/min)} \times \text{ratio}}{\text{Length of stroke (m)}} \)

\[ = \frac{12 \text{ m per minute} \times 2}{0.32 \text{ m}} \]
\[ = 37.5 \times 0.667 \]
\[ = 25,013 \text{ strokes / minute} \]

12.2.2 Rough time = \( \frac{\text{width (mm)}}{\text{Feed x strokes per minute}} \)

\[ = \frac{180 \text{ mm}}{3 \text{ mm / stroke} \times 25,013 \text{ strokes / minute}} \]

(b)
= 180
 75,0375
12.2.3 = 2.39 minutes = 2 minutes; 23.38 seconds

Total time = 2 minutes; 23.88 sec + 4 minutes; 48 sec + 10 min
= 17 minutes 11, 88 seconds

QUESTION 13: CENTRE LATHE

13.1 To allow bigger work pieces that can normally swing over the bed to be machined.

13.2 A ~ Spindle
   B ~ Barrel
   C ~ Adjusting screws
   D ~ Nut

13.3 When engage it grips onto the lead screw while cutting screw threads on the lathe.
   Acme thread

13.4 The set up time to manufacture one part is a loss. It is more expensive. It costs a lot to repair.
   (ANY TWO FACTS)

13.5 Pipe centre – used to support pipes, tubes and work pieces with large holes at their ends.

QUESTION 14: MILLING MACHINE

14.1 A Over arm
       B Arbor support
       C Arbor
       D Knee
       E Spindle

14.2 14.2.1 True
      14.2.2 False
      14.2.3 True
      14.2.4 False
      14.2.5 True