NATURAL SCIENCE
MARKING GUIDELINES

November 2011
FITTING AND MACHINING THEORY N2
11022032

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PAS- EN MASJINEERTEORIE N2
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N2
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SECTION A - ALL QUESTIONS ARE TO BE MARKED IN THIS SECTION

QUESTION 1

OCCUPATIONAL SAFETY

NOTE Candidates need answer ONLY QUESTION 1.1 or QUESTION 1.2

| 1.1.1 | TRUE     | (1) |
| 1.1.2 | TRUE     | (1) |
| 1.1.3 | FALSE    | (1) |
| 1.1.4 | FALSE    | (1) |
| 1.1.5 | TRUE     | (1) |

OR

| 1.2.1 | TRUE     | (1) |
| 1.2.2 | TRUE     | (1) |
| 1.2.3 | FALSE    | (1) |
| 1.2.4 | FALSE    | (1) |
| 1.2.5 | TRUE     | (1) |

[5]

QUESTION 2

COUPLINGS

2.1 COUPLING – is a permanent assembly/connection between a drive source and a driven source
CLUTCH – is an assembly / connection which couples the drive source to a driven source AND can be engaged and/or disengaged by the operator

| 2.2 | Spider | (1) |
|     | Bibby  | (1) |
|     | Metal Disc | (1) |
|     | Rubber | (1) |
|     | Tyre | (1) |
|     | Pin and rubber bush | (1) |

2.3 Axial

| 2.3 | Radial | (1) |
|     | Angular | (1) |

(2)

QUESTION 3

LIMITS AND FITS

| 3.1.1 | HOLE BASIS – The hole is of a fixed dimension and the shaft is fitted accordingly in terms of limits and fits. | (1) |
| 3.1.2 | SHAFT BASIS – the shaft is fixed and the hole is fitted accordingly in | (1) |

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terms of limits and fits
3.2.1 Hole basis (1)
3.2.2 TYPE OF FIT - Transition (1)
3.2.3 TOLERANCE OF SHAFT - (+18; +2/7 plus 0.018 mm; plus 0.002 mm) (1)
3.2.4 UNI-LATERAL TOLERANCE (1)

QUESTION 4
BEARINGS

4.1 Disruption in fluid supply, insufficient lubricant (1)
Foreign material, dirt, grit (1)
Faulty maintenance and assembly (1)
High operating temperatures (1)
Incorrect lubricant (1)
Faulty design (1)
Flat on rolling element (1)
Ovality of shaft (1)
Incorrect grade of lubricant (1)

4.2 Screw puller (1)
hydraulic puller (1)
puller plates (1)
impact puller (1)
hydraulic press (1)
wheel puller (1)
Slide-hammer (pull extractor) (3)

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QUESTION 5
LUBRICATION AND VALVES

5.1 Sight feed lubricator (1)

5.2 The device consists of glass container (1)
As oil reservoir gauge glass to view the oil moving drop for drop onto bearing cap feed-handle to open and close a needle valve for control of oil flow. (2)

5.3
A OIL FILLER CAP (1)
B SPRING (1)
C FEED NUT (1)
D NEEDLE VALVE (1)
E SIGHT GLASS (5)

QUESTION 6
PACKING, STUFFING BOXES AND JOINTS AND WATER PIPE SYSTEMS

6.1
A. PACKING (1)
B. PIPE FLANGE (1)
C. GLAND (1)
C. PIPE (4)

6.2.1 Form a water-tight seal to prevent leaks (1)

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6.2.2 The pump would leak
Maintaining the pressure within a container
Pump efficiency would be affected

6.3.1 HOLE
6.3.2 TUBE
6.3.3 SEAL

QUESTION 7    PUMPS

7.1 CENTRIFUGAL
7.2
A INLET
B CASING
C OUTLET
D EYE
E IMPELLER

QUESTION 8    COMPRESSORS

8.1 Acts as a DRYER
Cools air within a TWO-STAGE compressor between the high pressure (final) stage and the receiver
AFTER second stage compression

8.2 Moisture trap
8.3 ROTARY LOBE
ROTARY SCREW
ROTARY VANE
ROOTS COMPRESSOR

QUESTION 9    V-BELTS, CHAIN AND GEAR DRIVES

9.1 Protect persons working in the vicinity
Protects the machinery in case of chain breakage
Contains the lubrication
Prevents dirt and moisture from entering

9.2 A DRIVEN PULLEY
B ARC OF CONTACT
C JOCKEY
D DRIVE PULLEY
E CENTRE DISTANCE
SECTION B

QUESTION 10  HYDRAULICS AND PNEUMATICS

10.1 Pressure relief valve is used to obtain AND maintain the prescribed hydraulic system pressure (1)

10.2

10.2.1 4/2 Directional control valve (1)

10.2.2 Flow control valve – variable flow (1)

10.2.3 Check valve (1)

10.2.4 Filter with water trap (1)

10.2.5 Service unit (1) (5)

10.3 Check valve (1)
Directional Control Valve (1)
Pressure relief valve (1)
Throttle valve (1)
Pressure reducer valve (1)
Flow control valve (1) (6)

10.4 check oil-level in crankcase (1)
belt-tension of motor to pulley drive (1)
pressure regulator cut-out pressure on pressure gauge (1)
donair receiver (1)
check condition of filter element (1) (5)

10.5 PUMP – TRANSFORMS MECHANICAL ENERGY TO PRESSURE ENERGY / FLUID ENERGY (1) (1)

10.6.1 The BOTTOM OF THE TANK SLOPES DOWNWARD – ALLOWING DIRT PARTICLES TO SETTLE AWAY FROM THE SUCTION SIDE. (1)

10.6.2 COOLING TAKES PLACE AS A RESULT OF A WEIR OR DIVIDER PLATE KEEPING HOT OIL ON ONE SIDE AWAY FROM THE SUCTION SIDE (2) [20]

QUESTION 11  CENTRE LATHES
11.1 Compound slide
Taper turning attachment
Tailstock set-over

11.2 Time saving
Concentricity is guaranteed
Batch production is possible
Mandrels can be modified to suit later work
Setting up can be done by unskilled operators

11.3 Material type
Stock length
Information from drawing
Sequence of operation
Cutting tools required
dwell, delay or pause during elements of one cycle
Coolant application
dimensioning or sizes.

11.4 ABSOLUTE PROGRAMMING
This system measures all tool movement from a fixed point, origin or zero.

INCREMENTAL PROGRAMMING
This system allows each tool movement to be made with reference to the previous or last position.

11.5 \[ L = f \times N \times t \]
\[ t = \frac{L}{f \times N} \]
\[ = \frac{250}{0.5 \times 199} \]
\[ = 2 \text{ min } 30.7 \text{ secs} \]

11.6 To support long and slender work-pieces between the lathe spindle and tail-stock
To reduce unnecessary vibration or chatter, thus ensuring a better finish.
To support work-pieces against the pressure of heavy machining.
To maintain concentricity of long work-pieces while machining.

11.7 PLAIN MANDREL
SCREW MANDREL
EXPANDING MANDREL
DOUBLE CONE MANDREL
GROUP MANDREL

[20]
12.1 Power consumption is reduced (1)
Chattering is reduced (1)
Much better cutting action (1)
Sharpening / grinding is made easy (1) (4)

12.2

12.2.1

1. \[
\frac{40}{N} = \frac{40}{58} = \frac{20}{29}
\] (1)

The required indexing is therefore 20 HOLES with the crank-handle using PLATE No. 2 – BROWNE & SHARPE. THIS MUST BE DONE FOR EACH TOOTH X 58 (1)

3. To calculate 20 / 29 of a turn, we select PLATE No. 2 (1)

29 hole circle of side 2 of the BROWNE & SHARPE index plate

4. 20 holes in a 29 hole circle (3)

12.2.2

1. Use the formula \( \frac{N}{9} \) (1)

2. \( \frac{45}{9} = 5 \) turns of the crank handle (1)

3. 5 full turn of the crank (1) (3)

12.3.1 OFF HAND GRINDING (1)
This is done on a bench or pedestal grinder and the workpiece is usually held in the hands.

Example – hand-sharpening of a drill bit (1) (2)

12.3.2 PRECISION GRINDING (1)
This is used to finish hardened parts to accurate sizes of micro-tolerances

This is used for the precision sharpening of milling cutter angles (1) (2)

12.4 Horizontal spindle with linear table movement (1)
Horizontal spindle type with rotary table movement (1)

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Vertical spindle type with linear table movement (1)
Vertical spindle type with rotary table movement (1)

12.5 Machine vibration (1)
Wheel spindle vibration (1)
Out-of-balance wheel (1)
Machine not securely mounted (1) (2)

12.6 Coolant supply disrupted (1)
Wheel too hard (1) (3)
Clogged wheel (1) [20]

TOTAL SECTION B: 60
GRAND TOTAL: 100