higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

AMENDED MARKING GUIDELINE

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N2

1 AUGUST 2019

This marking guideline consists of 9 pages.

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QUESTION 1: OCCUPATIONAL SAFETY

1.1 1.1.1 D ✓
1.1.2 E ✓
1.1.3 A ✓
1.1.4 B ✓
1.1.5 C ✓

(5 × 1)

OR

1.2 1.2.1 F✓
1.2.2 D ✓
1.2.3 B ✓
1.2.4 A✓
1.2.5 C ✓

(5 × 1) **[5]**

QUESTION 2: COUPLINGS

2.1 2.1.1 Permanent/Fixed/Rigid coupling✓

2.1.2 Flexible✓

(2 × 1) (2)

2.2 2.2.1 Fluid drive coupling✓ (1)

2.2.2 Permanent/Fixed/Rigid coupling✓ (1)

2.2.3 A – driving member (turbine) ✓
B – driven member (pump) ✓ (2)
[6]

QUESTION 3: LIMITS AND FITS

3.1 40,030 mm✓ (1)

3.2 40,035 mm✓ (1)

3.3 39,980 mm✓ (1)

3.4 Maximum allowance = (40 + 0,035 mm) – (40 – 0,020 mm)
= 40,035 – 39,98✓
= 0,055 mm✓ (2)

3.5 Minimum allowance = (40 + 0,030 mm) - (40 - 0,010 mm)
= 40,030 – 39,99✓
= 0,04 mm✓ (2)
[7]

QUESTION 4: BEARINGS

4.1 A bearing is a device designed to reduce/minimise friction between two parts of a machine, one stationary and the other rotating. ✓ (1)

4.2
- White metal✓
- Cast iron✓
- Bronze✓
- Nylon✓
- Teflon

(Any 4 × 1) (4)
[5]

QUESTION 5 : LUBRICATION AND VALVES

5.1
- Siphon-wick lubricator✓
- Sight-feed lubricator✓
- Needle lubricator✓
- Drip-feed lubricator

(Any 3 x 1) (3)

5.2 When a fluid flows through a foot valve, the flap of the foot valve opens ✓ and allows the fluid to flow.✓ If the flow of the fluid is reversed, the flap closes and does not allow the fluid to flow back.✓ (3)
[6]

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

6.1
- Pressure within the pipe✓
- Nature of fluid medium✓
- Temperature of fluid✓
- Environmental conditions✓

(4 x 1) (4)

6.2 The wedge design prevents steam from escaping by applying a light pressure on the piston rod. ✓ (1)

6.3
- Plastic piping is relatively cheap✓
- Easy to handle due to its light weight✓
- No machining required✓
- Good insulator when used with electricity✓
- Combining pipes is very easy
- Corrosion resistant
- Easy to machine

(Any 4 x 1) (4)
[9]

QUESTION 7: PUMPS

7.1 7.1.1 Single acting pump✓
7.1.2 Double acting pump✓
7.1.3 Piston pump✓
(3 × 1) (3)

7.2
- Gear pump✓
- Helical screw gear pump✓
- Vane type pump✓
- Flexible impeller pump
- Screw pump
- Herringbone gear pump

(Any 3 × 1) (3)
[6]

QUESTION 8: COMPRESSORS

A – Air intake/air inlet/suction port/suction side✓
B – Diffuser ring✓
C – Volute casing✓
D – Impeller eye✓ (4 × 1) **[4]**

QUESTION 9: V-BELTS, GEAR DRIVES, CHAIN DRIVES AND REDUCTION GEARBOXES

9.1
- Chain drives✓
- Gear drives✓
- Belt drives

(Any 2 × 1) (2)

9.2 The deflection should be 16 mm for every meter of span. ✓ (1)

9.3
- To transmit high power ✓
- Where high mechanical is required✓
- To increase speed and reduce torque or vice versa✓
- To change the direction of drive
- When space is limited
- Timing as in automobile engines

(Any 3 × 1) (3)

9.4 9.4.1 Ensure that bearings are well lubricated✓ (1)

9.4.2 Measure the sag and adjust if it is too large✓ (1)

9.5
- The speed of the motor would be too fast.✓
- The heavy load put onto the motor would cause the motor to stop rotating✓

(2)

9.6
- Single-reduction gearbox✓
- Double-reduction gearbox✓
- Worm and worm-wheel gearbox

(Any 2 × 1) (2)
[12]

TOTAL SECTION A: 60

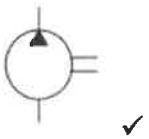
SECTION B (Any TWO answers)

QUESTION 10: HYDRAULICS AND PNEUMATICS

10.1
- Power transmission✓
- Lubrication✓
- Cooling✓
- Prevents corrosion
- Removes dirt

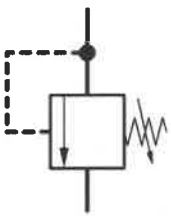
(Any 3 × 1) (3)

10.2 10.2.1



✓

10.2.2



✓

10.2.3

✓

Alternative responses:

(3 × 1) (3)

10.3 10.3.1 Provides mechanical energy to the hydraulic fluid. ✓

10.3.2 It protects the system from experiencing excessive pressure. ✓

10.3.3
- Stores hydraulic fluid until it is required.✓
- Allows contaminants from the fluid to settle down at the bottom of the tank
- Dissipates heat generated in the circuit system
- Serves as the base for mounting the electric motor and the pump
- Tank provides the drain point for oil in case the oil has to be renewed

(3 × 1) (3)

10.4 Control valve✓ (1)

10.5 10.5.1 Non-return valve/check valve✓
10.5.2 Compressor✓
10.5.3 Pneumatic motor✓
10.5.4 Pressurised receiver/air receiver/air reservoir✓
10.5.5 Single acting cylinder✓

(5 × 1) (5)

10.6 10.6.1 False✓
10.6.2 True✓
10.6.3 True✓

(3 × 1) (3)

10.7
- Not affected by dust or corrosive atmospheres✓
- Can be used in damp and inflammable conditions✓

(2)
[20]

QUESTION 11: CENTRE LATHES

11.1
- Used to support long work pieces on a centre lathe✓
- Used for turning long, small diameter shafts on a centre lathe✓

(2 x 1) (2)

11.2 11.2.1 Travelling steady✓
11.2.2 Fixed steady✓

(2 × 1) (2)

11.3 Angle that the thread makes with a line perpendicular to the axis of the thread✓ (1)

11.4 11.4.1

$$Lead = No.of\ starts \times Pitch\ of\ thread$$
$$= 3 \times 10$$
$$= 30\ mm\checkmark$$

$$\tan\theta = \frac{Lead}{\pi Dm}$$

$$= \frac{30}{\pi \times 155}\checkmark$$

$$= 0{,}0616$$

$$\theta = 3°\,31'\ \text{or}\ 3.525^0\checkmark$$ (3)

11.4.2

$$Leading\ \ tool\ angle = 90° - (Helix\ angle + Clearance\ angle)$$
$$= 90° - (3°31' + 3°)\checkmark$$
$$= 90° - (6°31')$$
$$= 83°29'\text{or}\ 83.475°\checkmark$$ (2)

11.4.3

$$Following\ \ tool\ angle$$
$$= 90° + (Helix\ angle - Clearance\ angle)$$
$$= 90° + (3°31' - 3°)\ \checkmark$$
$$= 90° + (0°31')$$
$$= 90°31'\ \text{or}\ 90.525^0\checkmark$$ (2)

11.5 $N = 24\,r/sec$
$N = 24 \times 60$
$\underline{N = 1\,440\,r/min}$✓

$V = \pi DN$
$= \pi \times 0{,}02 \times 1440$✓
$\underline{N = 90{,}478\ m/min}$✓ (3)

11.6 $L = f \times N \times t$

$f = \frac{L}{N \times t}$✓

$= \frac{700}{130 \times 15}$✓

$\underline{f = 0{,}36\,mm/rev}$✓ (3)

11.7 11.7.1 G-commands✓
11.7.2 M-commands✓

(2 × 1) (2)
[20]

QUESTION 12: MILLING MACHINES AND SURFACE GRINDERS

12.1 Used to indicate the fraction of a turn in the holes on a specific hole-circle. OR They maintain the number of holes which represent the fraction part of a turn✓ (Any 1) (1)

12.2 The Cincinnati index plate has holes on both sides so it is reversible ✓ whereas the Brown and Sharp system has three loose plates with different hole-circles on each plate.✓ (2)

12.3 Slab milling cutter or rose cutter✓ (1)

12.4 $42° 45'$

$= 42\frac{45}{60}$

$= 42\frac{3}{4}$ ✓

$Indexing = \frac{N}{9°}$

$= \frac{42\frac{3}{4}}{9}$

$= \frac{171}{4\times9}$ ✓

$= \frac{19}{4}$

$= 4\frac{3}{4}$ ✓

$= 4\left[\frac{3}{4} \times \frac{4}{4}\right]$ ✓ OR $4\left[\frac{3}{4} \times \frac{5}{5}\right]$

$= 4\frac{12}{16}$ ✓ $= 4\frac{15}{20}$

✓ ✓

Indexing = 4 full turns of the crank handle and 12 holes in a 16-hole circle OR
4 full turns of the crank handle and 15 holes in a 20-hole circle (7)

12.5
- Prevents the continuous forming of shavings✓
- Helps in the removal of shavings✓
- Reduces chattering✓
- Easier flow of coolant✓
- Improves the finish on the workpiece
- Provides a better cutting action
- More economical on power consumptions

(Any 4 × 1) (4)

12.6 12.6.1 Grit size refers to the actual size of the abrasive particles✓

12.6.2 Grade of the grinding wheel refers to the strength of the bond which holds the abrasive grains in place; Or refers to the hardness or softness and is relative to the strength of the bond to hold the grains of the wheel in position. ✓

12.6.3 The structure of the wheel refers to the spacing of the grit in the wheel✓

12.6.4 The structure number indicates the structure of the grinding wheel✓

(4 × 1) (4)

12.7 Produces a flat surface which is smooth and highly accurate. ✓ (1)
[20]

TOTAL SECTION B: 40
GRAND TOTAL: 100