

higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

**NATIONAL CERTIFICATE
NOVEMBER EXAMINATION
FITTING AND MACHINING THEORY N2
12 NOVEMBER 2014**

This marking guideline consists of 9 pages.

√ = ½ mark

✓ = 1 mark

SECTION A**QUESTION 1**

- 1.1
- Do not allow cylinders to slide or come into contact with sharp edges. They may be rolled but not dragged.
 - Do not drop cylinders or allow them to come into violent contact with each other or with other hard objects.
 - Never load or offload cylinders by mean of electromagnetic cranes or chain-slings. A cage or lifting basket, made especially for the task, should be used.
 - Do not tamper with the safety devices found on the valves.
 - Do not use cylinders as roller beds for moving heavy articles.
 - Use a special cylinder trolley or hand truck, where possible.
 - Mark empty cylinders by using chalk or other marking material to distinguish between them and others which are full.
 - Always handle cylinders as if they are full.
 - Remove pressure regulators and equipment and replace valve guards before transporting cylinders.
 - Use warm, not boiling water, to free frozen valves as the fusible plug on acetylene cylinders melts at boiling point.

(Any 5 × 1)

[5]**OR**

- 1.2
- No person should leave any naked light or flame on or near any combustible material or inflammable substance.
 - No combustible waste material must be stored in the vicinity of any installed electrical appliance or heating apparatus.
 - No welding, flame-cutting or flame heating must take place unless fire extinguishers have been provided.
 - No person is allowed to smoke or carry an open light in any cage, skip or any other conveyance in any shaft.
 - Calcium carbide is not to be taken underground unless it is in a lamp or water-tight container approved by the manager.
 - All machinery must be constructed, installed, operated and maintained so as to prevent dangerous heating

(Any 5 × 1)

[5]**QUESTION 2**

- 2.1 Universal coupling (1)
- 2.2 This coupling connects two shafts ✓ whose axes are at an angle, other than 180°, with each other. ✓ (2)
- 2.3 No. ✓ It accommodates self alignment group. ✓ (2)

[5]

QUESTION 5

- 5.1
- Speed between moving parts
 - Operating temperature
 - Load on bearing
 - Cost of lubricant
 - Environment
 - Clearance between the two components

(Any 5 × 1) (5)

- 5.2 A ball valve consists of a ball with a hole through it. ✓ When the opening in the ball coincides with that of the pipeline, the fluid will flow. ✓ If the handle is turned through 90° to the pipeline, no flow will take place. ✓

(3)
[8]**QUESTION 6**

- 6.1
- Clean all surfaces.
 - Ensure the correct seal is used.
 - Ensure no damage while installing seal.
 - Lubricate the seal before installing.
 - Use a protective sheath over a threaded section to protect the seal.
 - Always tighten up lightly in the beginning for squaring up the seal.

(Any 5 × 1) (5)

- 6.2
- Screwed
 - Welded
 - Flanged
 - Bell and spigot
 - Butt and strap joint
 - Threaded union

(Any 4 × 1) (4)
[9]**QUESTION 7**

- 7.1 A pump is used to transfer fluids or liquids from one place to another.

OR

A pump is used to move fluids or liquids from a low level to a higher level.

(1)

- 7.2
- A – Inlet
 - B – Outlet
 - C – Driven gear
 - D – Driver gear

(4 × 1) (4)
[5]

QUESTION 8

- 8.1 False
8.2 True
8.3 False
8.4 True
8.5 True
8.6 False
8.7 True

(7 × 1) [7]

QUESTION 9


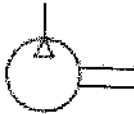

- 9.1.1 Velocity ratio is the relationship between the speeds of the drive gear to the speed of the driven gear OR the number of teeth of the driven gear to the number of teeth on the drive gear. (1)
- 9.1.2 Mechanical advantage is the resultant effect between two meshing gears and can be obtained by varying the velocity ratio between them. (1)
- 9.2
- Slip will take place when overloaded whereas in chain drives the chain may break.
 - No lubrication required in belt drives whereas chain drives require lubrication.
 - Requires little attention as compared to chain drives.
 - Cheaper maintenance than chain drives.
 - Not as costly as chain drives,
 - Can operate over longer distances.

(Any 3 × 1) (3)
[5]

TOTAL SECTION A: 60

SECTION B

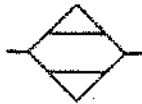
QUESTION 10

- 10.1 • Pressure
 • Volume (2)
- 10.2 A – Regulator or safety valve
 B – Filter
 C – Pump
 D – Tank or reservoir (4 × 1) (4)
- 10.3 • Transmits energy or power
 • Lubricates
 • Prevents corrosion
 • Removes dirt
 • Cools (Any 3 × 1) (3)
- 10.4 • Storage of hydraulic fluid
 • Dissipates heat generated in the system
 • Separates air from oil
 • Allows contaminants to settle to the bottom (Any 2 × 1) (2)
- 10.5 10.5.1 3
- 10.5.2 2
- 10.5.3 Normally closed – return to tank
- 10.5.4 3/2 Directional control valve (4 × 1) (4)
- 10.6 10.6.1 
- 10.6.2 
- 10.6.4 

10.6.4



10.6.5

(5 × 1) (5)
[20]**QUESTION 11**

- 11.1
- G – Commands
 - M – Commands
 - Positional data
- (3)

11.2 11.2.1

$$\begin{aligned} \text{Set-over} &= \frac{\text{length of workpiece}}{2} \times \text{Ratio} \\ &= \frac{280}{2} \times \frac{1}{14} \\ &= 10 \text{ mm} \end{aligned}$$

(2)

11.2.2

$$\begin{aligned} \tan \frac{\theta}{2} &= \frac{0,5}{14} \quad \checkmark \\ \frac{\theta}{2} &= \tan^{-1} 0,0357 \quad \checkmark \\ \frac{\theta}{2} &= 2,045^\circ \quad \checkmark \\ \theta &= 4,09^\circ \quad \checkmark \\ \theta &= 4^\circ 5,4' \quad \checkmark \end{aligned}$$

(3)

11.3

$$S = \pi DN$$

$$\begin{aligned} N &= \frac{S}{\pi D} \quad \checkmark \\ &= \frac{56,55}{\pi \times 0,01} \quad \checkmark \\ &= 1800 \text{ rev/min} \quad \checkmark \end{aligned}$$

(3)

11.4

11.4.1

- 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.

(Any 2 × 1) (2)

- 11.4.2 Travelling (1)
- 11.4.3 Fixed (1)
- 11.5 11.5.1 $Lead = No. of starts \times Pitch$
 $= 2 \times 10$
 $= 20 mm \quad \checkmark$
- $Pitch\ diameter = OD - \frac{1}{2} \times Pitch$
 $= 70 - \frac{1}{2} \times 10 \quad \checkmark$
 $= 65 mm \quad \checkmark$
- $\tan \theta = \frac{Lead}{Pitch\ circumference}$
 $= \frac{20}{\pi \times 65} \quad \checkmark$
 $= 0,0797 \quad \checkmark$
- $\therefore \theta = \tan^{-1} 0,0797$
 $= 5,59^\circ \quad \checkmark$ (3)
- 11.5.2 Leading angle $= 90^\circ - (\text{helix angle} + \text{clearance angle})$
 $= 90^\circ - (5,59 + 3^\circ) \quad \checkmark$
 $= 81,41^\circ \quad \checkmark$ (1)
- 11.5.3 Following angle $= 90^\circ - (\text{helix angle} + \text{clearance angle})$
 $= 90^\circ + (5,59 - 3^\circ) \quad \checkmark$
 $= 92,59^\circ \quad \checkmark$ (1)

[20]

QUESTION 12

- 12.1
- Rapid Indexing
 - Simple Indexing
 - Angular Indexing
 - Differential Indexing
- (Any 3 × 1) (3)
- 12.2
- 12.2.1 Simple indexing (1)
- 12.2.2 The number of teeth is easily divisible into 40 ✓ with a remainder
divisible into one of the Cincinnati hole circles. ✓ (2)
- 12.2.3
- $$\frac{40}{N} = \frac{40}{13} = 3\frac{1}{13} \quad \checkmark$$
- $$= 3 \text{ turns and } \frac{1}{13} \text{ of a turn} \quad \checkmark$$
- $$\frac{1}{13} \times \frac{3}{3} = \frac{3}{39} \quad \checkmark$$
- Required indexing = 3 turns of crank & 3 holes in a 39 hole circle ✓ (3)
- 12.3
- Abrasive type
 - Grade of wheel
 - Bonding material
 - Grain size
 - Structure
- (5)
- 12.4
- Less power consumption.
 - Easy to sharpen.
 - Cheaper to manufacture.
 - Chattering is reduced.
- (4)
- 12.5
- Gang
 - Straddle
 - Slab
 - Slotting
 - Up-cut
 - Down-cut
 - Gear-cutting
 - Spiral or Helical milling
 - End-milling
- (Any 2 × 1) (2)

[20]

TOTAL SECTION B: 40
GRAND TOTAL: 100