higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

ENGINEERING SYSTEMS
NQF LEVEL 2

21 November 2023

This marking guideline consists of 6 pages.

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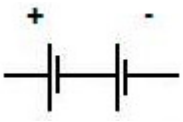
QUESTION 1

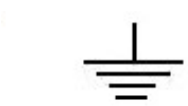
1.1 A
1.2 B
1.3 D
1.4 C
1.5 B
1.6 A
1.7 B
1.8 A
1.9 D
1.10 B

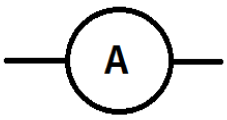
(10 × 1) **[10]**

QUESTION 2

2.1 2.1.1  ✓

2.1.2  ✓

2.1.3  ✓

2.1.4  ✓

2.1.5  ✓

(5 × 1) (5)

2.2 An electrical control device is a device that controls the ON and OFF flow of current in a circuit.✓
Example: Switch, Contactor or Relay✓✓

An electrical protection device is a device that prevents electrical damage to a circuit.✓
Example: Fuse, Circuit breaker, Earth leakage✓✓ (6)

2.3 2.3.1

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$
$$\frac{1}{R_P} = \frac{1}{5} + \frac{1}{10} + \frac{1}{15} \checkmark$$
$$\frac{1}{R_P} = \frac{11}{30} \checkmark$$
$$\frac{R_P}{1} = \frac{30}{11}$$
$$R_P = 2.727\Omega \checkmark$$ (3)

2.3.2
$$V_T = I_T \times R_T$$
$$12 = I_T \times 2.727 \checkmark$$
$$I_T = 4.4A \checkmark$$ (2)

2.3.3
$$V_{15} = I_{15} \times R_{15}$$
$$12 = I_{15} \times 15 \checkmark$$
$$I_{15} = 0.8A \checkmark$$ (2)

2.3.4
$$P_{15} = V_{15} \times I_{15}$$
$$P_{15} = 12 \times 0.8 \checkmark$$
$$P_{15} = 9.6W \checkmark$$ (2)

[20]

QUESTION 3

3.1 3.1.1 Rack-and-pinion gear
3.1.2 Worm gear
3.1.3 Bevel gear (3)

3.2 3.2.1 Gear A – anticlockwise
Gear C – anticlockwise (2)

3.2.2 Gear A – driver/drive gear
Gear B – idler/intermediate gear
Gear C – driven gear (3)

3.2.3
- To change the rotational direction of gear C
- To change the speed and torque (Any ONE) (1)

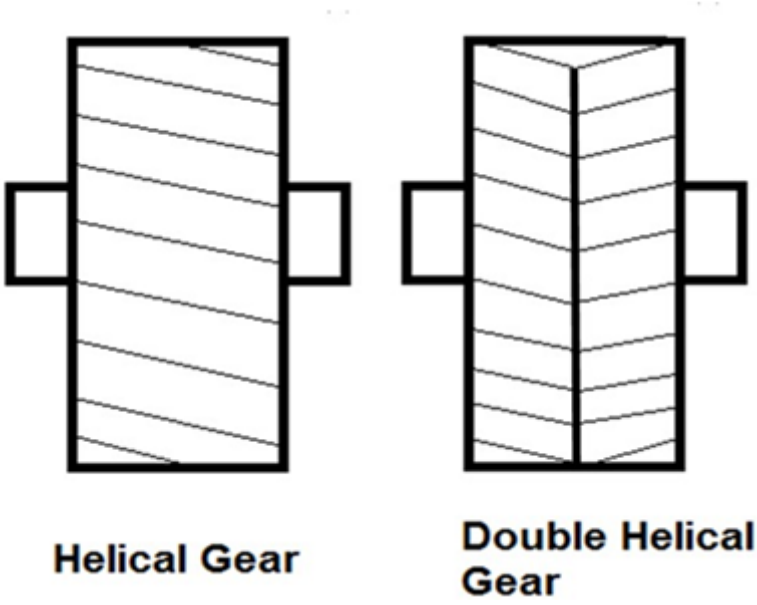
3.3 3.3.1 Backlash is the amount of clearance or free play✓ between two gears in mesh.✓ (2)

3.3.2 **Too much backlash**
- Gears can slam into each other
- Gear teeth can break-off
- Noise
- Vibration (Any 2 × 1)

Too little backlash
- Too much friction
- Overheating (2 × 1) (4)

3.3.3
- Dial test indicator
- Feeler gauge (Any ONE) (1)

3.4



(4)
[20]

QUESTION 4

4.1
- Ensure that the workpiece is secure
- Do not use faulty or damaged equipment
- Do not exceed the capacity of the press (3)

4.2
4.2.1 Check for leaks at pipe connections;✓ Check pipe for cracks✓
4.2.2 Check for leaks at the connections;✓ Check cylinder cracks✓
4.23 Check for leaks;✓ Check cracks ✓ (3 × 2) (6)

4.3
- Hydraulic system uses hydraulic or fluid pressure to operate.
- Pneumatic systems use compressed air to operate.
- Pneumatic systems operate under low pressure while Hydraulic systems operate under high pressure.
- Pneumatic systems are fast-working systems while Hydraulic systems are slower in operation. (4)

4.4
- Hydraulic brake
- Air brake
- Thruster brake
- Electromagnetic brake (4)

4.5
- Hydraulic systems are expensive
- Slower in operation
- Hydraulic oil is expensive
- Risk of fire
- Contamination of the environment because of oil leaks (Any 3 × 1) (3)

[20]

QUESTION 5

5.1
5.1.1 Ohmmeter/Multimeter
5.1.2 Oil filter/Strainer
5.1.3 Internal circlip/Circlip plier
5.1.4 Dial gauge
5.1.5 Torque wrench (5 × 1) (5)

5.2
- To obtain all the specifications
- To check the procedure for dismantling and assembly of components
- To establish the correct part numbers (Any 2 × 1) (2)

5.3
- Use a lubricating oil or grease between the surfaces.
- If possible, insert bearings between the surfaces.
- Polish an existing surface.
- Use lightweight material.
- Use material with a low coefficient of friction. (Any 3 × 1) (3)

[10]

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QUESTION 6

6.1
- Routine maintenance is the basic check and minor adjustment✓ that is performed before the machine is put into operation, either at the start of every shift or daily or weekly.✓
- Preventative maintenance is the practice of maintaining the machine on a regular schedule✓ based on elapsed time or meter readings.✓ (4)

6.2 6.2.1
- Rags
- Gaskets and gasket sealers
- Locking devices
- Filters
- Lubricants (Any 2 × 1) (2)

6.2.2
- Lifespan of the machine is improved
- Ensures a high level of safety in the workshop
- Reduced downtime (Any 2 × 1) (2)

6.2.3
- Name of technician
- List of components that were replaced
- Next date for maintenance
- Cost of the replaced components (Any 3 × 1) (3)

6.3
- It helps to compile a history of the performance of a particular machine.
- It enables the establishment of a scheduled maintenance task.
- It helps to determine if machinery should be replaced. (Any 3 × 1) (3)

6.4 6.4.1
- Equipment will be set up and serviced correctly, improving the safety of the equipment.
- Faulty or broken equipment will be identified and rectified during maintenance, reducing the risk of injury

6.4.2
- Equipment will be set up accurately resulting in equipment operating more accurately and efficiently
- Damaged or faulty components will be identified and replaced, increasing the efficiency of the equipment.

6.4.3 Due to fewer breakdowns, there will be an increase in production and higher profit margins.✓✓

(Any 3 × 2) (6)
[20]

TOTAL: 100

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