higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MECHANOTECHNOLOGY N3

28 November 2023

This marking guideline consists of 6 pages.

Copyright reserved

QUESTION 1: POWER TRANSMISSION

1.1
- The number of teeth on the sprocket
- Centre distance between sprockets
- Position of the drive
- The length of the chain link
- Operational speed
- The space that is available
- Operational conditions
- Environmental conditions
- Size of the chain
- Size of the load
- Ratio between load magnitude and chain drives
- The power to be transmitted
- The torque to be transmitted
- Nature of unit to be driven
- Method of lubrication to be applied on the chain (Any 5 × 1) (5)

1.2
- Axial displacement
- Parallel misalignment
- Angular misalignment (3)

1.3
- The initial cost is high.
- Many frictional surfaces where slip can take place.
- Heat generation is high due to many frictional surfaces.
- Clutch engagement is not instantaneous.
- The coefficient of friction is low. (Any 4 × 1) (4)

1.4 The clutch is used to **transmit power** through **movement from one rotating shaft/part of the machine to another shaft/part** of the machine. (2)

1.5
- Power transmitted
- Type of lubrication to be used
- Load capacity
- Different applicable ratios/varying of speeds
- Stresses generated on gear teeth
- Space available
- Shaft arrangement
- Direction of the drive (Any 4 × 1) (4)

1.6
- Grease or oil on the contact areas
- Faulty operation of, or adjustments to the control mechanisms
- Glazing of the friction surfaces due to continual slippage (Any 2 × 1) (2)

[15]

Copyright reserved

QUESTION 2: BRAKES

2.1
- Air can be extended to a trailer of a large truck, for instance.
- The force obtained by compressed air is unlimited.
- The brakes will function if the reservoir contains air.
- Air as operating medium is relatively cheap. (4)

2.2 False (1)
[5]

QUESTION 3: BEARINGS

3.1
- Solid bearings
- Part bearings
- Split bearings
- Thrust bearings
- Guide bearings (5)

3.2
- Relation between temperatures and clearance
- Speed
- Lubrication and maintenance
- Bearing inspection
- Bearing cleaning (5)

[10]

QUESTION 4: WATER PUMPS, COOLING AND LUBRICATION

4.1
- Inlet valve/admission valve
- Outlet valve/discharge valve
- Plunger or piston (3)

4.2
- Moving parts of the pump may be worn, so the clearance between the impeller and the casing is too big.
- The pressure inside the pump may be too low because the pumping velocity is too low.
- A faulty foot valve that stays open.
- The strainer may be exposed above the fluid level.
- Blockage in the strainer.
- The suction head may be too high, especially in recently installed pumps.
- Air in the pump casing or suction column that slips into the pump at the flanges or at the stuffing boxes. (Any 5 × 1) (5)

4.3
- In a direct cooling system there is a greater distortion of components because operating temperatures are higher.
- Water jackets in indirect cooling systems absorb sound, reducing engine noise. Directly cooled engines are thus noisier.
- A fan fitted to blow air over the engine in a direct cooling system absorbs a certain amount of engine power, making the engine less efficient. (3)

4.4
- Remove heat.
- Lubricate moving parts.
- Absorb vibration and shocks.
- Prevents metal-on-metal contact.
- Prevents rusting of highly finished tooth surfaces. (Any 4 × 1) (4)

[15]

QUESTION 5: HYDRAULICS AND PNEUMATICS

5.1 Pneumatic power is used to drive tools and machines requiring rotary motion, such as drills, and reciprocating motion such as hammers. (2)

5.2 5.2.1
$$A = \frac{\pi}{4} \times d^2$$
$$= \frac{3,142}{4} \times (30)^2 \checkmark$$
$$= 706,858 \checkmark½\ cm^2 \checkmark½$$ (2)

5.2.2
$$P = FA$$
$$= 1600 \times 0,07069 \checkmark$$
$$= 18,096 \checkmark½\ kPa \checkmark½$$ (2)

5.3
- Prepares the air for use in the system
- Conditions the compressed air so as to provide clean air at optimal pressure.
- Adds lubricant to extend the life of those pneumatic components

(Any 2 × 1) (2)

[8]

QUESTION 6: INTERNAL COMBUSTION ENGINES

6.1
- The power output of the diesel engine is lower.
- The manufacturing costs are very high due to expensive fuel injection systems in diesel engines.
- Diesel engines cause more pollution than petrol engines.
- Diesel engine are noisier than petrol engines. (Any 2 × 1) (2)

6.2
- The intake valve opens just before the piston reaches top dead centre.
- The piston moves to bottom dead centre.
- Downward movement creates a vacuum in the cylinder.
- Clean air is sucked into the cylinder while the exhaust valve is closed. (4)

[6]

QUESTION 7: CRANES AND LIFTING MACHINES

7.1
- Covering area of the crane is limited because it is fixed in one position.
- The crane is static and cannot move around while it is in operation.
- The crane capacity decreases as the operating radius increases.
- The costs of operation such as erection, dismantling and transport are very high. (4)

7.2
- Broken wires
- Kinks
- Wear on the rope (3)

[7]

QUESTION 8: MATERIAL AND MATERIAL PROCESS

8.1 8.1.1 Plastic softens when heated and solidifies again on cooling. (2)

8.1.2
- Production of photographic film
- Production of polyethylene pipe and pipe fittings
- Production of bottles
- Production of polypropylene house appliances and containers
- Buttons
- Electrical components and connectors
- Melamine dinner ware
- Brake shoes
- Surface coating (Any 1 × 1) (1)

8.1.3 Plastic undergoes a chemical change during moulding and can never be softened by reheating. (2)

8.1.4
- For impregnated resins
- Buttons
- Electrical components and connectors
- Melamine dinner ware
- Brake shoes
- Surface coating (Any 1 × 1) (1)

8.2 8.2.1 Light purple
8.2.2 Red
8.2.3 Orange

(3 × 1) (3)

[9]

QUESTION 9: INDUSTRIAL ORGANISATION AND PLANNING

9.1
- Inform
- Persuade
- Educate
- Bring about a certain reaction
- Entertain
- Remind
- Understand
- Stimulate action
- Socialise
- Command (Any 5 × 1) (5)

9.2
- Don’t assume anything
- Don’t interrupt.
- Don’t react too quickly (Any 3 × 1) (3)

9.3
- Quantity of the item needed
- When the items are needed
- By whom the request was made
- Quantity available (Any 2 × 1) (2)

[10]

QUESTION 10: ENTREPRENEURSHIP

10.1
- The concept 'entrepreneurship' refers to a situation where a person who, as an entrepreneur, **creates a new business** in the **face of risks and uncertainty** to **achieve a profit and growth**.
- This is done by **identifying opportunities** and **assembling the necessary resources to use** and to capitalise on these opportunities. (4)

10.2
- Entertainment, sport and hobbies
- Holidays
- Watch children and babies
- Housekeeping activities
- Talk to other people
- Media
- Shopping around✓ (Any 6 × 1) (6)

[10]

TOTAL: 100

Copyright reserved