higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

MECHANOTECHNOLOGY N3

5 APRIL 2016

This marking guideline consists of 8 pages.

QUESTION 1: POWER TRANSMISSION

1.1 1.1.1 Speed Ratio = $\frac{\text{Speed of faster pulley}}{\text{Speed of slower pulley}}$

$\therefore SR = \frac{1\,200}{700}$

$\therefore SR = 1{,}71 : 1$ (1)

1.1.2 Type of start = soft
Hours per day = 11

Read from TABLE 1
The service factor (SF) is 1,2 (1)

1.1.3 Design power (P) = P × SF
P = 30 × 1,2
$\therefore P = \underline{36\ KW}$ (1)

1.1.4 Refer to TABLE 2:

Consider:

N = 1 200 r/min
Design power = 36 KW
$\therefore$ d = 160 mm (1)

1.1.5 $\therefore$ No of belts = $\frac{\text{Design power}}{\text{Corrected power/belts}}$

$= \frac{36}{20{,}89}\surd$

= 1.723 belts√

= use 2 belts

(2)

1.2
- It can greatly reduce **speed**. ✓
- It can change direction of the **drive or rotation**. ✓
- The drive is **silent** ✓in operation.
- We can obtain an **increase in drive**. ✓

(4 x 1) (4)

1.3
A Shaft A
B Yoke
C Key
D Shaft B
E Cross piece

(5 x 1) (5)

1.4
- The **power** ✓which must be transmitted
- The **speed**✓ at which the drive must take place
- The **amount of torque**✓ to be transmitted
- The **duration** ✓ of slip needed
- How often the machine will **engage and disengage** ✓
- The **condition**✓ under which the clutch is going to operate

(Any 5 x 1) (5)
[20]

QUESTION 2: BRAKES

- They require frequent attention to keep it effective due to the large numbers of levers and pivot points.
- Continuously wear of the lining means that the adjuster must be adjusted frequently.
- Dust and water have a detrimental effect on its operation.
- Cables and rods have a tendency to stretch which leads to loss in braking.
- It is a slow-response braking system. (5 x 1) **[5]**

QUESTION 3: BEARINGS

3.1
- Friction bearings operate on the principle of sliding friction.✓
- Anti-friction bearings operate on the principle of rolling motion.✓

(2 x 1) (2)

3.2 3.2.1 Spherical roller bearing ✓ (1)

3.2.2
- Very high radial loads ✓
- Axial loads acting in both directions✓ (2)

3.2.3 The bearing is self-aligning.✓ (1)

3.3
- They are **quiet**✓ in operation
- They are **cheap or low in cost**✓.
- They have great **rigidity**✓.
- They can be **easily repaired**✓ when they are worn.

(4 x 1) (4)
[10]

QUESTION 4: WATER PUMPS, COOLING AND LUBRICATION

4.1 Water hammer is caused by a **sudden change in speed**✓ at which the fluid is moving, together with a proportional **change in pressure**.✓ This causes a loud hammer sound in the pipeline, which is called the '**knock' sound**.✓

(3)

4.2
- Splash lubrication ✓
- Syphon-wick lubrication ✓
- Sight-feed lubrication ✓
- Force-feed lubrication ✓
- Dry-sump lubrication ✓
- Lubrication by mixing oil and petrol✓ (Any 5 x 1) (5)

4.3
- The length of the plunger is **longer than its stroke.** ✓
- The length of the piston is **shorter than its stroke**.✓
- The packing of the plunger is housed **in a stuffing box** ✓at the end of the housing
- The piston has packing rings that are inserted on the **rim of the piston**✓to prevent leakage.

(Any 2 x 1) (2)

4.4
- Air in the pump casing or suction column that slips into the pump at the flanges or at the stuffing boxes.
- The suction head may be too high, especially in recently installed pumps.
- Blockage in the strainer.
- The strainer may be exposed above the fluid level.
- A faulty foot valve that stays open.
- The pressure inside the pump may be too low because pumping velocity is too low.
- Moving parts of the pump may be worn, so that clearance between the impeller and the casing is too big. (Any 5 x 1) (5)

[15]

QUSTION 5: HYDRAULICS AND PNEUMATICS

5.1 5.1.1 For distance that plunger moved (S):
Work done (W) = Force × Distance
W = F × S
250 = 1 200 × S ✓
S = 250/1 200
0,208 m = 208 mm✓

5.1.2 For volume of fluid displacement (v):

$$V = A \times S$$

$$V = \frac{\pi \times d^2}{4} \times S$$

$$= \frac{\pi \times 0{,}075^2}{4} \times 0{,}208 \quad \checkmark$$

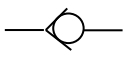
$$= 9{,}189 \times 10^{-4}\ m^3 \ \checkmark$$

(2 x 2) (4)

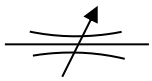
5.2
- They are infinitely flexible. ✓
- Hydraulic fluid cannot be compressed. ✓
- The pressure which is supplied to the system is available for work at any junction in the hydraulic system. ✓

(Any 2 x 1) (2)

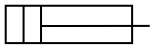
5.3 5.3.1



5.3.2



5.3.3



5.3.4

(4 x 1) (4)
[10]

QUESTION 6: INTERNAL COMBUSTION ENGINES

6.1 A – Blower supplies air to intake ✓
B – Intake port ✓
C – Exhaust port ✓ (3 x 1) (3)

6.2
- Induction phase ✓
- Exhaust phase ✓ (2 x 1) (2)

[5]

QUESTION 7: CRANES AND LIFTING MACHINES

7.1
- They can move from point A to point B under their own power while carrying the load. ✓
- Mobile cranes are allowed to move from one stand to another on public roads, as long as they comply with traffic regulations. ✓
- Heavy loads can be lifted to great heights. ✓
- Because mobile cranes can move forward and backward under their own power, heavy load can be reached and removed from difficult to reach points. ✓
- The crane jib can reach and pick up loads far from the crane. ✓

(Any 4 x 1) (4)

7.2
- The number **6** indicates the **number of strands** ✓ that makes up the steel ropes.
- The number **36** indicates the **number of wires** ✓each strand contains. (2)

7.3
- It can be exposed to **high temperatures**✓.
- The **strength** ✓ of the rope is increased.

(2)
[8]

QUESTION 8: MATERIAL AND MATERIAL PROCESSES

8.1
- It contains no irons ✓
- Non-magnetic ✓
- Corrosion resistant ✓ (3 x 1) (3)

8.2
- Copper
- Aluminium
- Tin
- Lead
- Zinc
- Antimony (Any 2 x 1) (2)

8.3 8.3.1 Very soft ✓
8.3.2 Stiff ✓
(2 x 1) (2)
[7]

QUESTION 9: INDUSTIAL ORGANISATION AND PLANNING

9.1
- Clock cards ✓
- Job cards ✓
- Requisition cards ✓
- Production flow cards ✓
- Maintenance schedules ✓

(5 x 1) (5)

9.2
- Interdepartmental meeting ✓
- Co-operation incentive ✓
- Social meeting ✓

(3 x 1) (3)

9.3
- Fear of discipline
- Concern about record
- Concern about reputation
- Fear of medical treatments
- Dislike of medical personnel
- Desire to prevent work interruption
- Desire to keep personal record clear
- Avoidance of red tape
- Concerned about relationship with others
- Poor understanding of importance (Any 4 x 1) (4)

[12]

QUESTION 10: ENTREPRENEURSHIP

10.1
- Self-confidence
- Persistence
- Opportunity-seeking ability
- Commitment strength
- Risk-taking ability
- Good setting ability
- Demand for quality and efficiency
- Information ability
- Systematic planning and monitoring
- Persuasion and networking (Any 5 x 1) (5)

10.2
- Trade show and exhibitions
- Visit a factory or manufacturer
- Flea markets
- Research expired patent
- Check overseas products
- Manipulate existing product or services or modify old products
- Be a copycat
- Visit places where people gather (Any 3 x 1) (3)

[8]

TOTAL: 100