higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MECHANOTECHNOLOGY N3

22 November 2022

This marking guideline consists of 7 pages.

MJ

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QUESTION 1: POWER TRANSMISSION, COUPLING OF SHAFTS, AND CLUTCHES

1.1.1 $N_{RATIO} = \frac{N_{MOTOR}}{N_{BELT}}$

$N_{RATIO} = \frac{1200}{750}$ ✓

$= 1{,}6 : 1$ ✓ (2)

1.1.2 Service factor = 1,2 (Light duty vs Heavy start vs 11 hours) (2)

1.1.3 $P_{DESIGN} = P_{MOTOR} \times SF$

$= 55 \times 10^3 \times 1{,}2$ ✓

$= 66 \surd \ kW \surd (2 \times ½)$ (2)

1.1.4 D = 236 mm (2)

1.2 The idler sprocket is to be placed on the slack/unloaded side of the drive.
The idler sprocket is to be placed near the driven sprocket.
The number of teeth for the sprocket should not be more than that of the smallest sprocket wheel.
It is ideal to place the idler sprocket on the outside of the chain.
There needs to be at least four chain pitches between the idler sprocket and the nearest sprocket.
The idler sprocket is to maintain a chain contact of at least three teeth. (6)

1.3 Flange couplings
Marine couplings
Muff couplings (3)

1.4 Single-disc clutch
Multi-disc clutch
Cone clutch (3)

[20]

QUESTION 2: BRAKES

2.1 Electromagnetic brake system (1)

2.2 A – Spiral springs
B – Brake shoe/pad
C – Lever
D – Shaft (4)

[5]

QUESTION 3: INTERNAL COMBUSTION ENGINE

3.1 Single row deep groove ball bearing ✓ and single row radial cylindrical roller bearing✓ (2)

3.2 A – Cylindrical roller
B – Lower shoulder/outer raceway/ring
C – Inner raceway/ring
D – Cage (4)

3.3 The type of the bearing (1)

3.4 Thy operate on a rolling motion.
This rolling motion reduces friction.
Using the roller/ball elements. (3)
[10]

QUESTION 4: WATER PUMPS, COOLING, AND LUBRICATION

4.1.1 True (1)

4.1.2 True (1)

4.1.3 False (1)

4.1.4 False (1)

4.1.5 True (1)

4.2.1 Too much oil causes carbon deposits, smoking, air pollution and ring sticking. (2)

4.2.2 Too little oil causes piston seizure, deposits on the piston skirts, wear and rusting. (2)

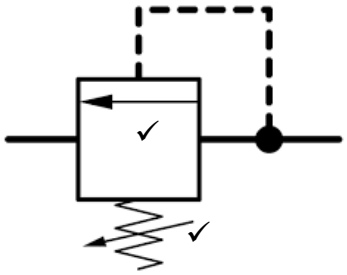
4.3 Direct air-cooling system
Indirect air-cooling system (2)

4.4 To store more air in the pressure tank
For easier lubrication
To minimize chances for explosion
To maintain the correct viscosity of the lubricant (4)
[15]

QUESTION 5: HYDRAULICS AND PNEUMATICS

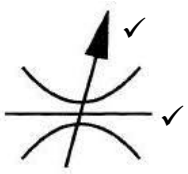
5.1 Hydraulic systems use hydraulic fluid/oil
Pneumatic systems use (compressed) air (2)

5.2.1



(2)

5.2.2



(2)

5.3.1 $A = \frac{\pi d^2}{4}$

$A = \frac{\pi(0,25)^2}{4}$✓

$A = 0,0491\surd\ m^2\surd$ (2 × ½) (2)

5.3.2 $F = p \times A$

$= 0,9 \times 10^6 \times 0,0491$✓

$= 44,19\surd\ kN\surd$ (2 × ½)

(2)
[10]

QUESTION 6: INTERNAL COMBUSTION ENGINE

6.1 To obtain a higher pressure in the cylinder of a petrol or diesel engine
To ensure that the cylinder is filled with an intake load at a pressure higher than atmospheric
To raise the compression pressure in the cylinder
To improve the volumetric efficiency of the engine (Any 1) (1)

6.2 Induction stroke
Compression stroke
Power stroke
Exhaust stroke (4)
[5]

QUESTION 7: CRANES AND LIFTING MACHINES

7.1.1 F (1)

7.1.2 E (1)

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7.1.3 D (1)

7.1.4 C (1)

7.1.5 A (1)

7.2 Pulling force
Force exerted by the arm
Downward force (weight) of the load (3)
[8]

QUESTION 8: MATERIAL AND MATERIAL PROCESSES

8.1
- Hardness
- Toughness
- Elasticity
- Plasticity
- Ductility
- Malleability
- Tensile strength (Any 4 × 1) (4)

8.2
- Toughness
- Low cost (cheap)
- Low density
- Low thermal conductivity
- Flexibility
- Chemical resistant
- Easy to form complex shapes (Any 3 × 1) (3)
[7]

QUESTION 9: INDUSTRIAL ORGANISATION AND PLANNING

9.1 Job cards
Clock cards
Requisition cards
Production flow charts
Maintenance schedules (Any 4 × 1) (4)

9.2 The loss of information
The lack of clarity
Credibility
Order of presentation
Timing (Any 4 × 1) (4)

9.3 To protect all employees at the workplace
To provide all matters related to occupational health and safety
To provide health and safety for all employees at the workplace
To establish an advisory council for occupational health and safety (4)
[12]

QUESTION 10: ENTREPRENEURSHIP

10.1 A situation whereby a person (entrepreneur) identifies an opportunity
and gathers the necessary resources to start a business
in the face of risk and uncertainty
in order to generate profit and growth,
and in the process creates job opportunities. (Any 4 × 1) (4)

10.2 The nature of the product on service
The size of your business (retailer/shop/workshop/business)
The nature of your business service (plumber/garden service/insurance, etc.)
Expansion potential
Business associates and partnerships (symbiosis)
Business competition
Distance from the main road
Accessibility by rail
Accessibility for deliveries (Any 4 × 1) (4)
[8]

TOTAL: 100

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