higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

NOVEMBER EXAMINATION

MECHANOTECHNOLGY N3

23 NOVEMBER 2016

This marking guideline consists of 6 pages.

QUESTION 1

1.1 1.1.1 Speed ratio (SR)

$$Speed\ Ratio\ (SR) = \frac{Speed\ of\ faster\ pulley\ (Ne)}{Speed\ of\ slower\ pulley\ (N)}$$

$$\therefore SR = \frac{900}{570}$$

$$\therefore SR = 1{,}58:1$$ (2)

1.1.2 Service factor (SF):

Consider: Heavy duty, soft start and duty hours per day

Read from TABLE 1
$\therefore$ The Service factor (SF) as 1,2 (1)

1.1.3 Design power:

Design power = Power (electric motor) x Service factor

= 105 x 1,2
= 126 kW (2)

½ mark for answer and ½ mark for unit

1.1.4 Minimum pulley diameter:
Take into consideration: Motor speed and design power
Motor speed = 900 r/min and design power = 126 kW

Read from TABLE 2 the minimum pulley diameter = 300 mm (1)

1.2 1.2.1 Basic power belt – It implies that **no power losses have been taken** into account and that the **drive runs under ideal conditions**

1.2.2 Corrected power per belt – **This is the power needed per belt** after the **power losses have been determined**

(2 x 2) (4)

1.3
- Positive
- Friction
- Centrifugal
- Hydraulic

(4 x 1) (4)

1.4 Drive part or input shaft known **impeller or the pump**
Driven part or output shaft known **follower or rotor** (2)

1.5 1.5.1 Pin-type flexible coupling (1)

1.5.2 A – Flange
B – Pin
C – Hole (3 x 1) (3)
[20]

QUESTION 2

2.1
- Air in the system will make the brakes feel spongy and you must bleed the system whenever it occurs.
- Fluid leaks in the system can cause brake failure. (2)

2.2
- Electromagnetic operating principle
- Hydraulic operating principle
- Air operating principle
- Mechanical operating principle

(Any 3 x 1) (3)
[5]

QUESTION 3

3.1
- Taper roller
- Cylindrical roller
- Spherical roller
- Ball (4 x 1) (4)

3.2 3.2.1 The force acting on a shaft has a line of action in line with the shaft's radius.

3.2.2 The force acting on the shaft has a line of action in the same line as the axis of the shaft.

(2 x 2) (4)

3.3
- Size or magnitude of the load
- Direction of the load (2 x 1) (2)
[10]

QUESTION 4

4.1 4.1.1 This valve ensures that the delivery column does not run dry while the pump is not in operation. (2)

4.1.2 The water supply to the pump is placed at a higher level than the pump. (1)

4.2
- When a plunger or piston moves too fast during the suction stroke
- A suction pipe with a diameter that is too small
- A suction head which is too high (3 x 1) (3)

4.3 4.3.1 Multistage pump (1)

4.3.2 A – Suction pipe
B – Pet cocks
C – Delivery column
D – Movable balance disc (4)

4.4
- Overheating the motor can cause short-circuit.
- If the running temperature of the motor is too high, the resistance increases and it will result in poor power and torque transmission.
- It prevents the insulation material from melting.
- The correct viscosity of the lubricant must be maintained to ensure that the bearings remain sealed. (4) **[15]**

QUESTION 5

5.1 5.1.1 Distance plunger moves:

Work done (W) = Force (F) x distance (s)

$$W = F \times s$$
$$320 = 1400\ x\ s$$
$$\therefore s = \frac{320}{1400}\ \checkmark$$
$$= 0{,}22857\ m$$
$$= 228{,}57\ mm\ \checkmark$$

½ mark for answer and ½ mark for unit (2)

5.1.2 Volume of fluid displaced (V):

Volume (V) = Area (A) x distances (s)

$$V = A \times s$$
$$= \frac{\pi . d^2}{4} \times s\ \checkmark$$
$$\therefore V = \frac{3{,}142 \times 0{,}09^2}{4} \times 0{,}22857\ \checkmark$$
$$= 0{,}0014541\ m^3$$

½ mark for answer and ½ mark for unit

OR

$$= 1{,}4541 \times 10^{-3} m^3 \checkmark$$ (3)

5.2 A – Pump
B – Filter
C – Reservoir or tank
D – Directional control valve or check valve
E – Actuator/piston or plunger (5)
[10]

QUESTION 6

6.1
- The power output of the dieselengine is lower.
- The manufacturing costs are very high due to the expensive fuel injection system of the diesel engine.
- A diesel engine causes more pollution than a petrol engine.
- A diesel engine makes more noise than a petrol engine. (Any 2 x 1) (2)

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

(4 x 1) (4)
[6]

QUESTION 7

7.1
- It has a maximum coverage with a minimum site space.
- The crane can move alongside the site to position itself to perform a specific function.
- The bogie can be mounted on a mobile chassis which moves under its own power.
- Because of its mobility it has a larger area of coverage than a static or climbing tower crane.
- It is better adapted to travel with a load. (Any 2 x 1) (2)

7.2
- Static tower crane on a concrete base
- Tower crane on a bogie running on rails
- The climbing-type tower crane (3 x 1) (3)

7.3
- It supports the strands.
- It lubricates the inside of the cable.
- It helps to prevent corrosion inside the cable.
- It provides a cushion effect to absorb shocks. (Any 2 x 1) (2)

[7]

QUESTION 8

8.1
- To soften carbon steel for machinability
- To release internal stresses
- To refine the grain structure
- To reduce brittleness (4)

8.2 8.2.1 Soft grey metal which is obtained from iron ore

8.2.2 Combinationof iron and carbon, or other elements in specific proportions to give the metal certain special properties.

(2 x 2) (4)
[8]

QUESTION 9

9.1
- Express personal impressions, complaints, grievances and problems
- Suggest improvements concerning work
- Acknowledge company policies and objectives
- Make management conscious of the attitudes and feelings of the sub-ordinates
- Participate in decision making
- Obtain information on how to perform certain jobs (6 x 1) (6)

9.2
- Number of components to be done
- Type of operation to be done
- Serial number
- The date
- The name of the operator (5 x 1) (5)

[11]

QUESTION 10

10.1 S – Strength of your business
W – Weakness of your business
O – Opportunities that may arise
T – Threats that can influence the sales of the business (4)

10.2 CP – Cost price

CP + (35% × CP) + (14% × CP) = R146,21✓
1,35 CP + (0,14 × 1,35 CP) = R146,21
1,35 CP + 0,189 CP = R146,21✓
1,539 CP = R146,21
CP = R146,21 ÷ 1,539✓
CP = R95,00 ✓ (4)

[8]

TOTAL: 100