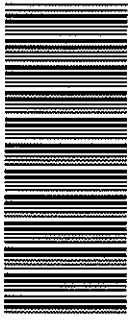


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Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1060(E)(N23)T
NOVEMBER EXAMINATION

NATIONAL CERTIFICATE

MECHANOTECHNOLOGY N3

(8190373)

23 November 2015 (X-Paper)
9:00–12:00

This question paper consists of 8 pages and 1 formula sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
MECHANOTECHNOLOGY N3
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
 2. Read ALL the questions carefully.
 3. Number the answers according to the numbering system used in this question paper.
 4. Write neatly and legibly.
-

QUESTION 1: POWER TRANSMISSION

- 1.1 A centrifugal compressor is driven by an electric motor. It is a medium duty drive operating for eight hours per day. The power transmission is by means of a wedge belt.

The following information is known:

Speed ratio	1.6 : 1
Number of belts used	2
Speed of pulley on compressor (slower pulley)	900 r/min
Diameter of small pulley	236 mm
Diameter of large pulley	375 mm
Corrected power per belt	22,09 kW/belt
Length of the belt	2 795,3 mm

Calculate the following:

- 1.1.1 The speed of the pulley on the electric motor (2)
- 1.1.2 Design power for this drive (3)
- 1.1.3 Centre distance between the pulleys (3)
- 1.2 State **THREE** factors to be considered when selecting a suitable wedge-belt drive. (3)
- 1.3 State **THREE** factors to be taken into consideration when you install a chain drive. (3)

1.4 Refer to FIGURE 1 that shows the different components of a roller chain. Label the components (A–F) as indicated

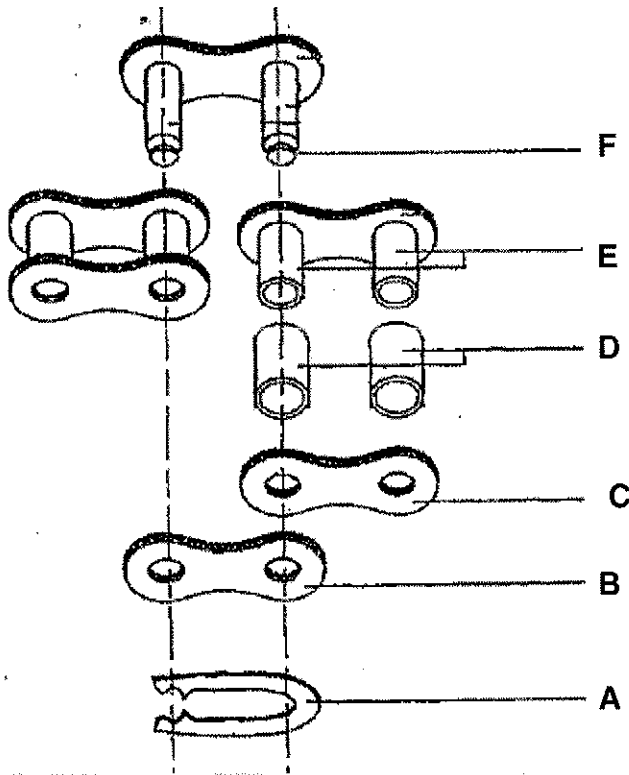


FIGURE 1

(6)
[20]

QUESTION 2: BRAKES

2.1 State FOUR advantages of an air-brake system. (4)

2.2 Indicate whether the following statement is true or false.

Cone brakes are friction brakes with cone-shaped rubbing parts. (1)
[5]

QUESTION 3: BEARINGS

3.1 Refer to FIGURE 2 and answer the questions.

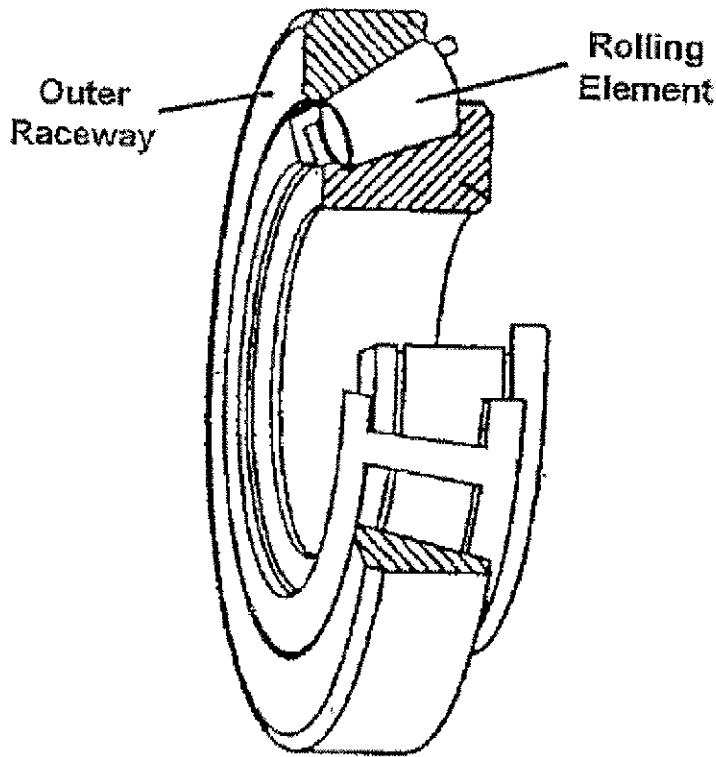


FIGURE 2

3.1.1 Name the bearing shown in FIGURE 2.

3.1.2 What type of load can this bearing carry?

(2 x 1) (2)

3.2 The specific types of anti-friction bearing we choose to use will depend on certain basic factors.

State FOUR of these factors.

(4 x 1) (4)

3.3 Bearing failures can be linked to one or more possible conditions or areas.

State FOUR of the possible conditions or areas.

(4 x 1) (4)

[10]

QUESTION 4: WATER PUMPS, COOLING AND LUBRICATION

4.1 Refer to FIGURE 3 of a plunger water pump and answer the questions.

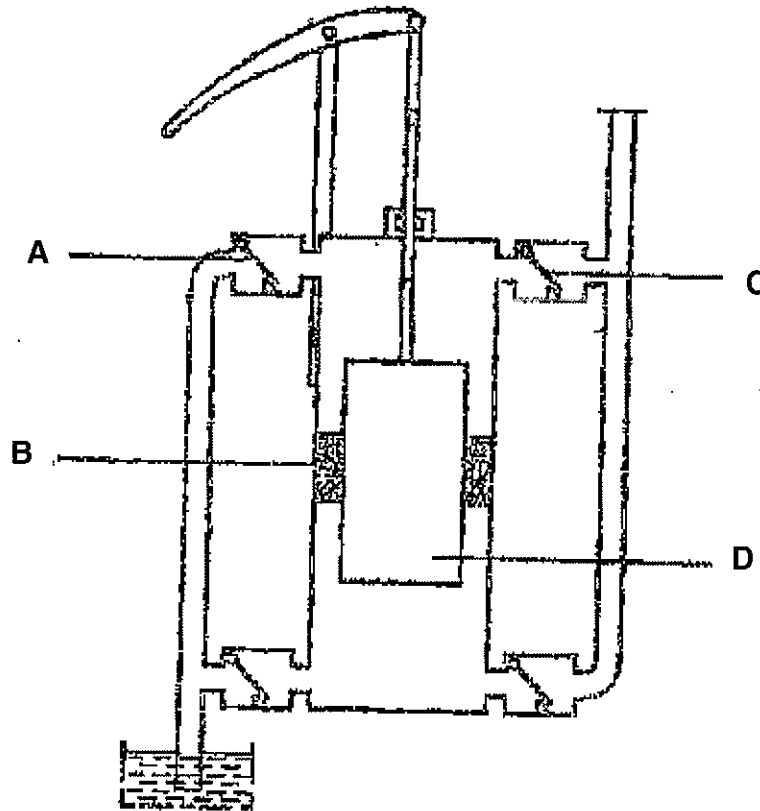


FIGURE 3

- 4.1.1 Name the parts (A–D) as indicated. (4)
 - 4.1.2 Is the pump in FIGURE 3 a single or double-acting pump? (1)
 - 4.2 Give FIVE reasons for the necessity of lubricating bearings. (5 x 1) (5)
 - 4.3 State THREE advantages of the direct cooling system. (3)
 - 4.4 State TWO disadvantages of the direct cooling system. (2)
- [15]

QUESTION 5: HYDRAULICS AND PNEUMATICS

5.1 The piston of a water pump has a diameter of 250 mm and a stroke length of 160 mm. The pump delivers a pressure of 400 kPa.

NOTE: Use $\pi=3,1416$

Calculate the following:

- 5.1.1 The volume of water that the piston displaces per stroke (2)
- 5.1.2 The volume of water that the piston displaces in three strokes (2)
- 5.1.3 The force exerted by the piston rod (2)
- 5.2 State the TWO sections that a basic pneumatic system consists of. (2)
- 5.3 Make neat drawing of the standardised symbols as applicable to a pneumatic system of the following:
- 5.3.1 Pressure gauge
- 5.3.2 Air receiver

(2 × 1) (2)
[10]

QUESTION 6: INTERNAL COMBUSTION ENGINES

Refer to FIGURE 4 which shows a two-stroke petrol engine, and answer the questions.

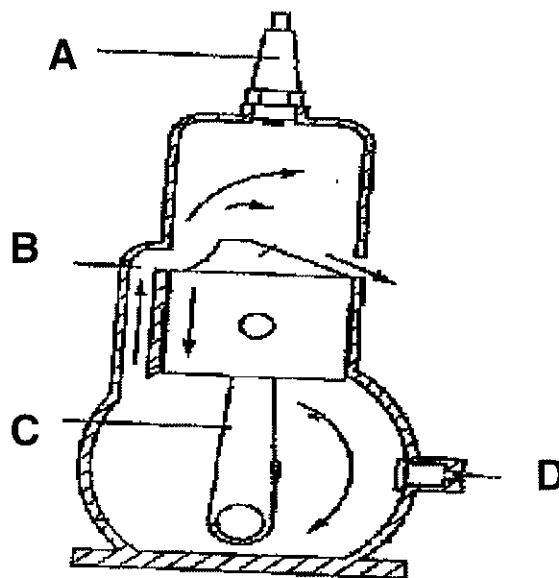


FIGURE 4

- 6.1 Name the stroke shown in FIGURE 4. (1)
- 6.2 Name the different parts labelled (A—D) as indicated. (4)
[5]

QUESTION 7: CRANES AND LIFTING MACHINES

- 7.1 Name FOUR types of cranes. (4)
- 7.2 State FOUR factors that are important when selecting steel rope. (4)

[8]**QUESTION 8: MATERIAL AND MATERIAL PROCESSES**

- 8.1 Define *non-ferrous metal*. (2)
- 8.2 List THREE characteristics of thermosetting plastics. (3)
- 8.3 Give THREE reasons for the hardening of metal as a heat-treatment process. (3)

[8]**QUESTION 9: INDUSTRIAL ORGANISATION AND PLANNING**

- 9.1 List FOUR aims of communication. (4)
- 9.2 List FOUR communication channels created by management. (4)
- 9.3 State FOUR matters to be taken into account on the assessment of the potential exposure of employees to substances, where the employer shall keep record of such assessment. (4)

[12]**QUESTION 10: ENTREPRENEURSHIP**

- 10.1 Define *metaphorical analogy*. (2)
- 10.2 State FIVE the qualities of an entrepreneur. (5)

[7]**TOTAL: 100**

MECHANOTECHNOLOGY N3**FORMULA SHEET**

Any applicable formula may also be used.

1. *Design power = Power (electrical motor) × service factor*
2. *Corrected power per belt = (basic power per belt + power increment per belt) × correction factor*
3. *Belt length (L) = [(Pitch diameter of larger pulley + Pitch diameter of smaller pulley) × 1,57] + (2 × Centre Distance)*
4. *Force (F) = Pressure (P) × Area (A)*
5. *Work done (W) = Force (F) × Distance (s)*
6. *Volume (V) = Area of base (A) × Perpendicular height ($\perp h$)*