higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ENGINEERING SYSTEMS
NQF LEVEL 2

(6021022)

11 December 2020 (X-paper)
09:00–12:00

This question paper consists of 6 pages.

549Q1N2011

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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. Start each question on a new page.
5. Use only a black or blue pen.
6. Write neatly and legibly.

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QUESTION 1

1.1 Complete the following table by writing only the missing quantity/unit/symbol next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

QUANTITY	UNIT	SYMBOL
Time	second	s
Mass	1.1.1 ...	1.1.2 …
1.1.3 …	metre	1.1.4 …
1.1.5 ...	kelvin	K
1.1.6 …	ampere	1.1.7 …
Luminous intensity	1.1.8 ...	cd
1.1.9 …	molecular	1.1.10 ...

(10 × 1) (10)

1.2 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

1.2.1 Parallel sprocket alignment causes early chain failure.

1.2.2 Maintenance on electrical motors is best done by boilermakers.

1.2.3 Lubricant leaking from bearing housing might indicate defective seals, loose bolts or loose nuts.

1.2.4 Span is the distance from the centre of one sprocket to the centre of the other.

1.2.5 The total chain movement in vertical drives should be approximately half the chain pitch.

(5 × 1) (5)

[15]

QUESTION 2

2.1 FIGURE 1 shows a basic pneumatic system.

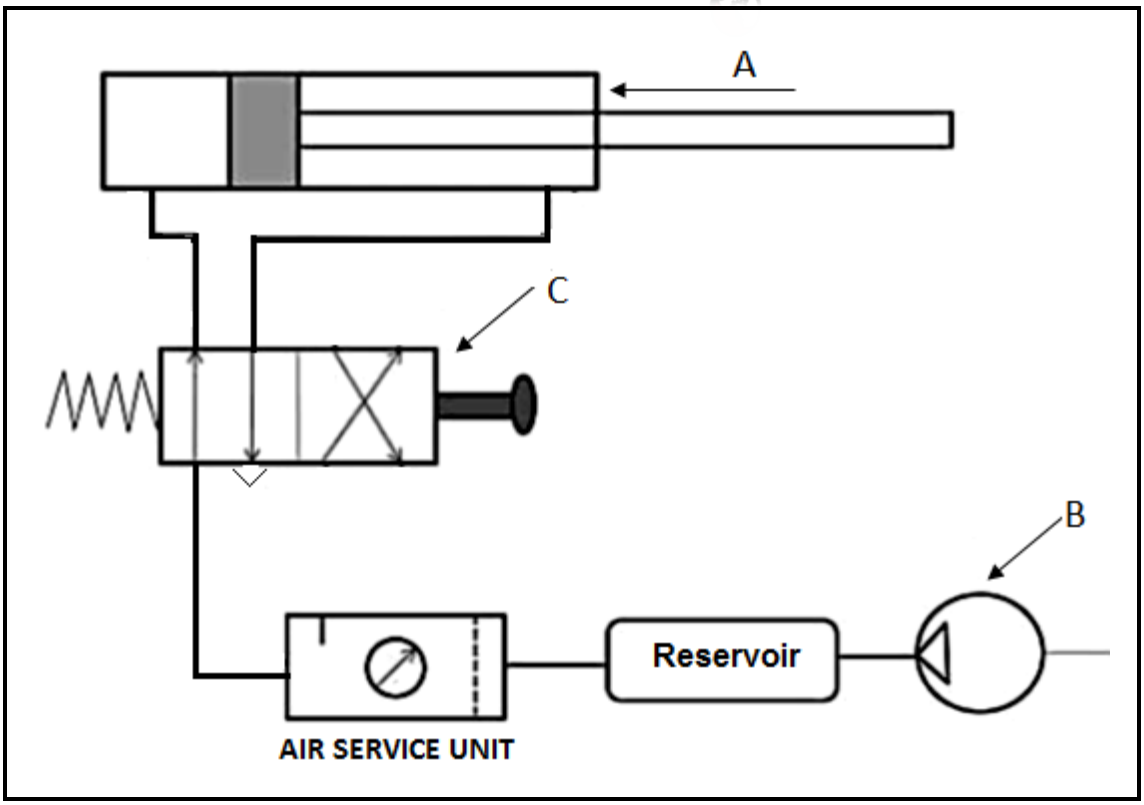


FIGURE 1

2.1.1 Label the components of the pneumatic system by writing only the answer next to the letter (A–C) in the ANSWER BOOK. (3 × 1) (3)

2.1.2 Name the THREE components that make up the air service unit. (3)

2.1.3 State the function of the reservoir. (1)

2.2 Give THREE advantages of a pneumatic brake. (3)

2.3 Redraw the following table in the ANSWER BOOK and complete it by listing THREE differences between *hydraulic systems* and *pneumatic systems*.

NO	HYDRAULIC	NO	PNEUMATIC
1		1	
2		2	
3		3	

(3 + 3) (6)

2.4 Differentiate between *direct current (DC)* and *alternating current (AC)*. (2 + 2) (4)

[20]

QUESTION 3

3.1 FIGURE 2 shows a simple gear drive. Gear V with 30 teeth is attached to a 55 kW motor that rotates at 360 r/min. The gear ratio between the drive gear and the driven gear is 1:3,5.

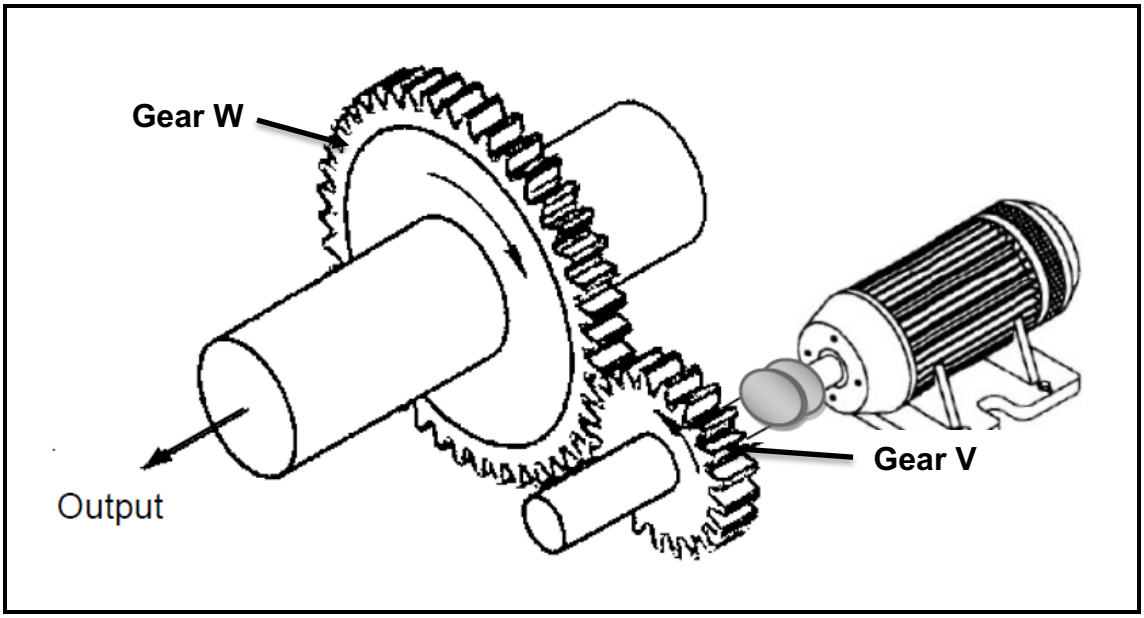


FIGURE 2

If no loss takes place, calculate:

3.1.1 The number of teeth on the driven gear (2)

3.1.2 The speed of the driven gear (3)

3.1.3 The torque developed by the driver

HINT: $VR = \frac{T_{gear}}{T_{pinion}}$, $VR = \frac{N_{pinion}}{N_{gear}}$, $P = \frac{2\pi NT}{60}$ (4)

3.2 Give ONE function of each of the following electrical components:

3.2.1 Diode

3.2.2 Light-emitting diode (LED)

3.2.3 Conductor

3.2.4 Resistor

3.2.5 Fuse

(5 × 1) (5)

3.3 Give THREE reasons why guards are fitted around gear drives. (3)

3.4 List THREE devices used for locking bolts and nuts. (3)

[20]

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QUESTION 4

4.1 List FIVE control system details as published in a manufacturer's manual. (5)

4.2 List FIVE functions of a control system. (5)

4.3 Give the meaning of each of the following acronyms:

4.3.1 PLC

4.3.2 CPU

4.3.3 CNC

(3 × 1) (3)

4.4 Give TWO advantages of a microswitch in electrical control systems. (2)

4.5 Name FIVE input devices that can be connected to a programmable logic controller. (5)

4.6 List FIVE checks to carry out on a machine before starting it after a service. (5)

[25]

QUESTION 5

5.1 Differentiate between *routine maintenance* and *preventative maintenance*.

(2 + 2) (4)

5.2 List FIVE benefits of a routine maintenance programme. (5)

5.3 Name FIVE types of chains used in power transmission. (5)

5.4 Give TWO factors that planned maintenance depends on. (2)

5.5 Name FOUR types of oil lubrication accessories. (4)

[20]

TOTAL: 100

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