higher education & training

Department:
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REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ENGINEERING SYSTEMS
NQF LEVEL 2

(6021022)

15 November 2024 (Y-paper)
13:00–16:00

This question paper consists of 7 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
ENGINEERING SYSTEMS
NQF LEVEL 2
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 section on a new page.
5. Use only black or blue ink.
6. Write neatly and legibly.

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QUESTION 1

1.1 Explain the meaning of an *engineering system*. (2)

1.2 Engineering systems consists of three main stages and each stage performs a major function on the system.

(3)

Name the THREE main stages.

1.3 Name FIVE types of simple mechanical components that uses mechanical advantage. (5)

[10]

QUESTION 2

Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–J) next to the question number (2.1–2.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1	An electronic device that converts one type of energy to another.	A	inductor
2.2	Removes large particles of foreign matter from a hydraulic fluid.	B	capacitor
2.3	Resistor that changes its value when there is a change in temperature.	C	Filter
2.4	Convert alternating current (AC) to direct current (DC).	D	actuator
2.5	The greatest potential difference that can be produced by a source of electrical current in a circuit.	E	magnetic plug
2.6	Electronic component that is used to store an electrical charge.	F	transducer
2.7	Removes small particles of foreign matter from a hydraulic fluid.	G	strainer
2.8	Stores an energy in a magnetic field.	H	rectifier
2.9	Mechanical device that controls a mechanism.	I	electromotive force
2.10	Removes iron or steel particles from the liquid.	J	thermistor

(10 × 1) **[10]**

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QUESTION 3

3.1 FIGURE 1 below shows a hydraulic system. Study the diagram and answer the following questions.

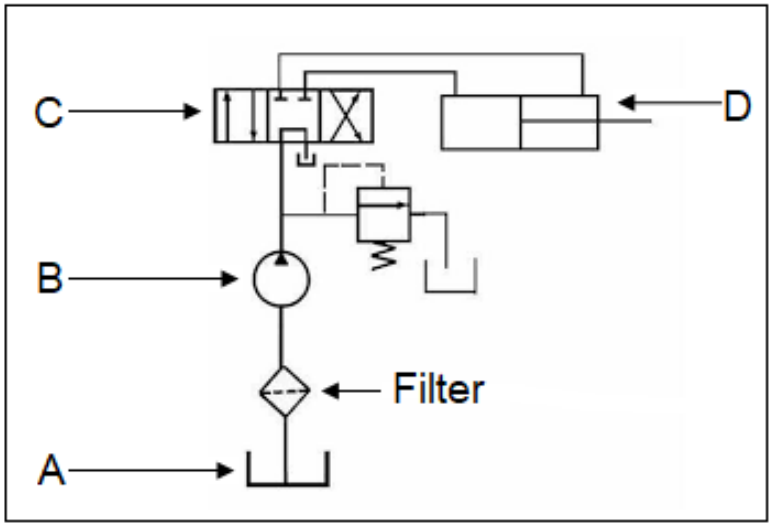


FIGURE 1

3.1.1 Label components (A–D) by writing the correct answer next to the letter in the ANSWER BOOK. (4)

3.1.2 What is the function of the filter? (1)

3.1.3 Give TWO reasons for preventing water from entering a hydraulic system. (2)

3.2 Engineering systems must be inspected regularly to avoid downtime. (5)

List FIVE symptoms to check when doing inspection.

3.3 When working with or maintaining engineering systems, certain safety measures needs to be observed. (5)

List FIVE safety measures.

3.4 A Manufacturer's manual is a document that is provided to a machine user that helps in using the machine.

List THREE important user information facts that can be obtained from the manufacturer's manual. (3)

[20]

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QUESTION 4

FIGURE 2 below shows a Compound Belt Drive. Study the figure and answer the questions that follow.

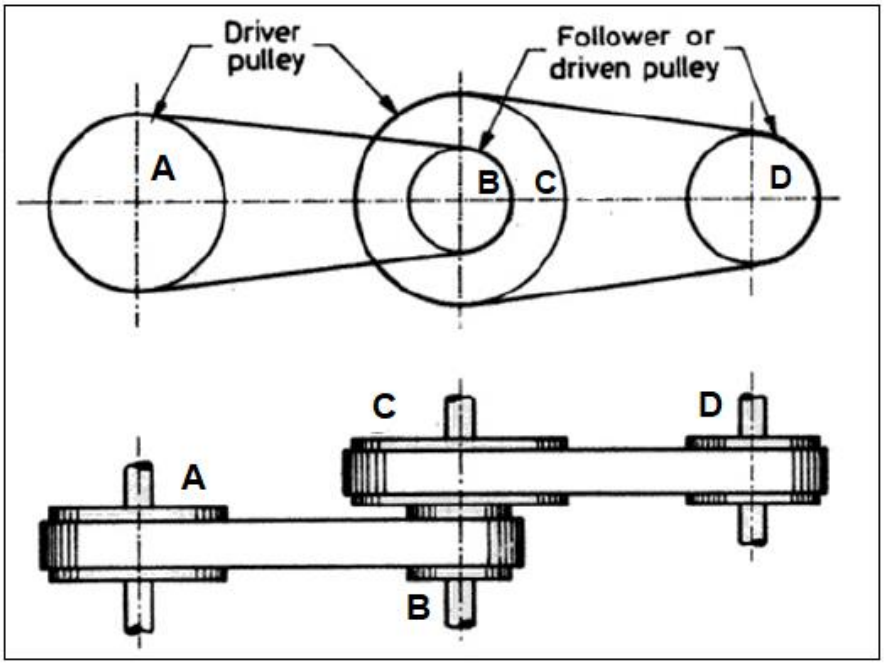


FIGURE 2

4.1 The rotational direction of pulley A is clockwise, give the rotational direction of pulleys B, C, and D. (3)

4.2 Name THREE types of belts used in engineering systems. (3)

4.3 Use the data below to answer the questions that follow:

Pulley A = 180 mm
Pulley B = 19,6 r/s
Pulley C = 160 mm
Pulley D = 90 mm

HINT: $D_A \times N_A = D_B \times N_B$; $D_C \times N_C = D_D \times N_D$

4.3.1 Calculate the diameter of pulley B if pulley A rotates at 14,2 r/s, (2)

4.3.2 State the rotational speed of pulley C in r/s. (1)

4.3.3 Calculate the rotational speed of pulley D. (2)

4.4 List THREE practices to maintain the efficiency and lifespan of a belt drive. (3)

4.5 Give THREE disadvantages of belt drive when compared to gear drive. (3)

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4.6 Belt drives depends on friction to operate, when the friction is excessive the belt will wear rapidly.

List THREE factors that can affect belt friction. (3)
[20]

QUESTION 5

5.1 Give the full meaning of each of the following acronyms:

5.1.1 CPU

5.1.2 AC

5.1.3 VR (3 × 1) (3)

5.2 Before assembling an electrical plug, you must be in full understanding of colour coding.

State the colours of the following conductors: Earth; Neutral; Live. (3)

5.3 Name TWO electrical protective devices that are used in electrical circuit to protect components from being damaged during overload. (2)

5.4 Draw and label a simple electrical circuit showing the following components: Battery/Cell; Wire/Conductor; Bulb/Resistor; Open/Closed Switch (5)

5.5 Give TWO factors that will influence the resistance in conductors. (2)
[15]

QUESTION 6

6.1 Name the TWO components that is used to minimise friction when a shaft is used in a mechanical system. (2)

6.2 Gears are one of the most popular and useful component in mechanical system.

Name THREE type of gears (3)

6.3 List THREE essential checks that must be conducted on the system during preventative maintenance. (3)

6.4 Give ONE function of the following components:

6.4.1 A *key* in a gear system

6.4.2 A *washer* as used in a bolt and nut configuration

(2 × 1) (2)
[10]

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QUESTION 7

7.1 Explain the importance of isolating machinery for routine maintenance. (2)

7.2 A job card is a document that details the work done on the machine and the costs involved.

List FOUR items that must be included in the document. (4)

7.3 Lubricants are used to reduce wear on components.

List THREE types of lubricants. (3)

7.4 Give FOUR reasons for regularly cleaning tools and equipment. (3)

7.5 List THREE benefits of a good maintenance plan. (3)

[15]

GRAND TOTAL: 100

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