higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1070**(E)**(M30)T

APRIL EXAMINATION

NATIONAL CERTIFICATE

MECHANOTECHNOLOGY N3

(8190373)

30 March 2015 (Y-Paper)
13:00–16:00

Calculators may be used.

This question paper consists of 6 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. All the drawings must be large, clear, neat and in good proportion.
5. Keep questions and subsections of questions together.
6. Write neatly and legibly.

QUESTION 1: POWER TRANSMISSION

1.1 A centrifugal pump is driven by an electric motor by means of a wedge belt.

The following information is available:

Type of wedge belt	16 N
Power of the electric motor	55 kW
Speed of the pulley on the centrifugal pump	720 r/min
Basic power per belt	16.8 kW
Power increment (additional power) per belt	1.15 kW
Approximate centre distance	± 900 mm
Speed of the pulley on the electric motor	1 440 r/min
Service factor	1,3
Correction factor	0,95

Calculate the following:

1.1.1 The design power (2)

1.1.2 The speed ratio (2)

1.1.3 The corrected power per belt in kW (3)

1.1.4 The number of belts (3)

1.2 State FOUR advantages of the centrifugal clutch. (4)

1.3 Refer to FIGURE 1 and answer the questions below.

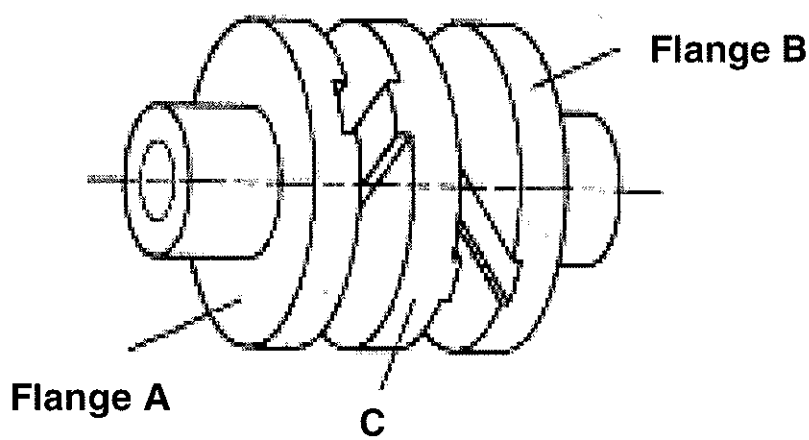

FIGURE 1

1.3.1 Name the type of coupling shown in FIGURE 1.

1.3.2 State the use of the coupling shown in FIGURE 1.

1.3.3 Name part C as shown in FIGURE 1.

1.3.4 State the function of part C as shown in FIGURE1.

(4 × 1) (4)
[18]

QUESTION 2: BRAKES

Give FOUR reasons for having brakes on a machine or a vehicle. **[4]**

QUESTION 3: BEARINGS

3.1 Name THREE main types of loads applicable to anti-friction bearings. (3)

3.2 Describe the use of the following types of friction bearings:

3.2.1 Part bearing

3.2.2 Solid bearing

3.2.3 Split bearing

3.2.4 Thrust bearing

3.2.5 Guide bearing (5 × 2) (10)
[13]

QUESTION 4: WATER PUMPS, COOLING AND LUBRICATION

4.1 Name THREE main types of impellers which are used in centrifugal pumps.
(3 × 1) (3)

4.2 State the use of each impeller mentioned in QUESTION 4.1
(3 × 1) (3)

4.3 Give FOUR reasons why it is necessary for a welding machine to be kept cool during usage. (4)

4.4 Explain why a pump will not deliver boiling water when the supply tank is below the pump. (3)
[13]

QUESTION 5: HYDRAULICS AND PNEUMATICS

5.1 The force inside a hydraulic cylinder is 200 kN and the pressure 70 MPa during an operation stage. Assume no loss of energy.

Calculate the following:

5.1.1 The inside cross-sectional area of the cylinder during the operation stage (2)

5.1.2 The diameter of the cylinder in millimetres. (3)

5.2 Name SIX components on the air-consuming side of a Pneumatic system. (6)
[11]

QUESTION 6: INTERNAL COMBUSTION ENGINES

Refer to FIGURE 2 below and answer the questions.

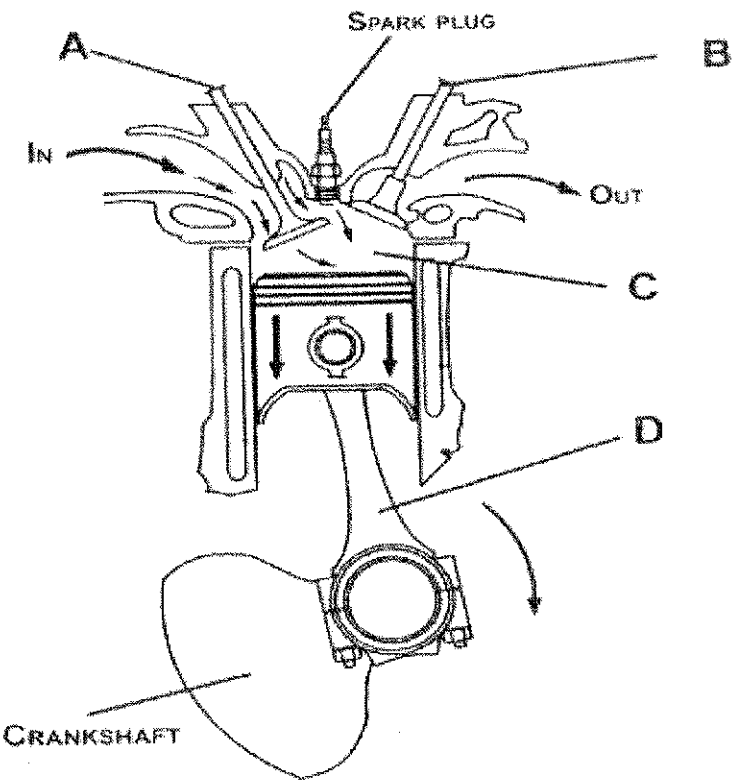

FIGURE 2

6.1 Name the stroke as shown in FIGURE 2. (1)

6.2 Name the different parts labelled A, B, C and D as indicated in FIGURE 2. (4)
[5]

QUESTION 7: CRANES AND LIFTING MACHINES

7.1 With reference to the movements of a crane.

Explain the FIVE uses of a crane. (5)

7.2 Langs lay refers to the weaving method of a steel rope.

Describe THREE advantages of this weaving method. (3)
[8]

QUESTION 8: MATERIAL AND MATERIAL PROCESSES

8.1 Explain the results of case hardening on low carbon steel when treated with a carbon-rich material. (4)

8.2 Explain what a ferrous metal is. (2)

8.3 Give ONE example of a ferrous metal. (1)
[7]

QUESTION 9: INDUSTRIAL ORGANISATION AND PLANNING

9.1 List FOUR types of disciplinary action that can be taken against any personnel member of a business enterprise. (4)

9.2 One of the channels of communication in an organisation is downward communication.

Describe FIVE limitations of this type of communication. (5)

9.3 List THREE types of verbal communication. (3)
[12]

QUESTION 10: ENTREPRENEURSHIP

10.1 LIST FIVE factors that will influence the location of a small business enterprise. (5)

10.2 Explain how an entrepreneur can develop or generate ideas for business opportunities from his/her daily activities. (4)
[9]

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* $(\perp h)$