UNIVERSITY OF JOHANNESBURG

FACULTY OF EDUCATION

NOVEMBER / DECEMBER

SUPPLEMENTARY EXAMINATION 2014

PROGRAMME: B Ed (Hons) TECHNOLOGY EDUCATION

MODULE: THE KNOWLEDGE OF TECHNOLOGY

CODE: TKT0017

TIME: 3 hours

MARKS: 200

EXAMINERS: Prof PJ Ankiewicz

Mr W Engelbrecht

MODERATOR: Dr W Rauscher (University of Pretoria)

(This paper consists of 5 pages)

INSTRUCTIONS

Read the following instructions carefully before answering the questions.

1. Answer **ALL** the questions.
2. Read the questions carefully and answer all the questions as specifically as possible. Do not give vague and general answers.
3. You can answer the questions in Afrikaans or English.
4. Answer questions 1 to 3 in Examination book 1 and questions 4 to 7 in Examination book 2.

Answer questions 1 to 3 in Examination book 1

QUESTION 1

1.1 Describe the modern material cycle (from beginning to end) of a stainless steel fork. (10)

1.2 Name five different classes of solid materials. (5)

1.3 In order to choose the most suitable material for a particular product you need to have a sound knowledge of the **properties** of materials. Write the names of the materials listed below in your examination book and state **one** use of each as well as **one** specific property that makes the material suitable for the use mentioned.

1.3.1	High carbon steel	(2)
1.3.2	Copper	(2)
1.3.3	Polypropylene	(2)
1.3.4	Phenol formaldehyde (Bakelite)	(2)
1.3.5	Borosilicate glass	(2)
1.3.6	Carbon fibre-reinforced polymer composites (graphite)	(2)

1.4 Product manufacturers use a wide range of processing techniques to convert materials into products. Briefly describe the process you would use to manufacture the following products:

1.4.1 Angle iron lengths by using mild steel (3)
1.4.2 Plastic garden chairs by using high density polyethylene (3)
1.4.3 Sheet glass by using soda-lime-silica compositions. (3)
(36)

QUESTION 2

2.1 All the items we use everyday have some form of structure. Name four different **functions** of structures and give one example of each. (8)

2.2 Failure occurs because of forces acting on a structure. Differentiate between **static** forces and **dynamic** forces. (4)

2.3 When forces are applied to frame structures they become deformed. Draw a simple frame structure and show in your drawing how you would make sure it is rigid. (4)

2.4 For a given material, the stiffness of a simple beam is proportional to its breadth x depth^3 (b x d^3). Use two examples that will illustrate this formula. Based on your examples, which one will resist bending the most? (5)

2.5 Demonstrate your understanding of compression forces and tension forces by drawing the following **labelled** sketches:
2.5.1 A bridge of which the structural elements have to resist mainly **compressive** forces. (3)
2.5.2 A bridge of which the structural elements have to resist mainly **tensile** forces. (3)

2.6 Figure 2.6 shows a beam with two known forces and a pivot point in the centre of the beam. Calculate the force needed at **B** to balance the beam. Use the following formula to guide your calculation:
moment = force x distance. (3)

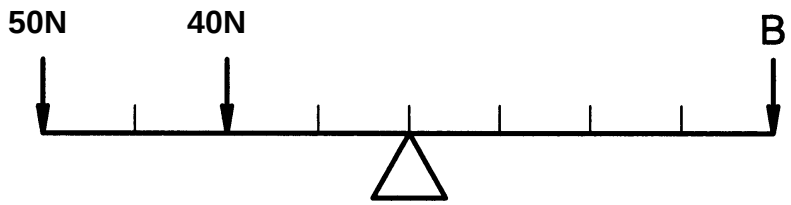

Fig. 2.6 **(30)**

QUESTION 3

3.1 Machines are made up of simple mechanisms. How would you define a mechanism? (2)

3.2 Name the four basic movements used in mechanisms. (4)

3.3 Briefly define the concept of friction. (2)

3.4 Name an example of a place where friction occurs in a mechanical device. (2)

3.5 Briefly explain the difference between a pulley and belt system and a chain and sprocket system. (4)

3.6 Give one example of a device where a pulley and belt system is used. (1)

3.7 Give one example of a device where a chain and sprocket system is used. (1)

3.8 Show by means of a sketch how you can mesh three gears (one driver gear, one idler gear and one driven gear) together to enable the driven gear to rotate in the same direction as the driver gear. Indicate the directions of rotation by using arrows. (6)

3.9 Figure 3.9 shows a device which contains link mechanisms. Sketch the linkages inside the device that would be needed to allow for the indicated movements. (5)

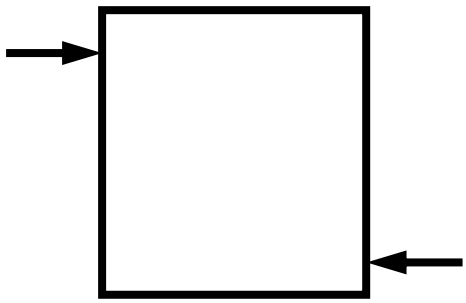

Fig. 3.9

3.10 Briefly describe the working of a hydraulic jack. (4)

3.11 Give three advantages of using oil instead of water in a hydraulic system. (3)

(34)

Answer questions 4 to 7 in Examination book 2

QUESTION 4

You have to plan a technology lesson for learners in Grade 9.

4.1 Which policy document(s) will you have to consult to assist you with this? Give the name(s). (2)

4.2 Briefly describe how the information contained in the document(s) will assist you. (5)

4.3 Which learning outcome/specific aim deals mainly with procedural knowledge? Motivate your choice. (2)

4.4 Where in the document(s) will you find technological conceptual knowledge of electrical systems and control for Grade 9? Name the document(s), give the page number, and quote a few examples directly. (3)

4.5 Briefly name the main themes of technological conceptual knowledge. (4)

4.6 The policy document(s) mentioned in 4.1 relates to each other according to the Minister of Education. However, they are based on two different paradigms. Identify the two paradigms and discuss issues around their compatibility. (10)

(26)

QUESTION 5

5.1 "Design is a particular kind of problem-solving."
Briefly explain the relationship between the problem-solving and the design process in technology. Give relevant examples. (5)

5.2 Name and discuss the steps of the dominant thinking sub-process of the technological process where the evaluation of the product is involved. (5)

5.3 Name and discuss the relationship between the four thinking sub-processes that constitute the technological process. (5)

5.4 Stages of the technological process:

5.4.1 Name and briefly discuss the stages of the technological process. (5)

5.4.2 Based on how the stages of the technological process proceed, two types of stage-orientated models for the technological process are distinguished. Briefly discuss the most important similarities and differences between the two types of models. (3)

5.4.3 Briefly provide reasons why the stages of the technological process can be classified as procedural knowledge. (3)

5.4.4 Briefly discuss how you will teach learners the stages of the technological process as procedural knowledge. (5)

5.5 Briefly explain the essential differences between the thinking dimension and the stages of the technological process. (3)

(34)

QUESTION 6

6.1 Define the concept *critical thinking*. (3)

6.2 Define the concept *creative thinking*. (3)

6.3 By means of an example of each discuss the process of:

6.3.1 Critical thinking. (5)

6.3.2 Creative thinking. (5)

6.3.3 Briefly discuss the distinguishable but inseparable nature of critical and creative thinking. (4)

(20)

QUESTION 7

7.1 Define the concept *decision making*. (3)

7.2 Define the concept *problem solving*. (3)

7.3 According to your opinion what is the difference between decision making and problem solving and illustrate your answer with an example. (4)

7.4 Name and discuss the steps of the design process and illustrate your answer with an example. (5)

7.5 Discuss the nature of the technological process. (5)

(20)

TOTAL: 200

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