UNIVERSITY
OF
JOHANNESBURG

PROGRAM	:	BACCALAUREUS INGENERIAE *MECHANICAL ENGINEERING SCIENCE*
SUBJECT	:	**DESIGN (MECHANICAL) 3A**
CODE	:	**OWM3A11/OWMMCA3**
DATE	:	WINTER SUPPLEMENTARY EXAMINATION JULY 2018
DURATION	:	(1-PAPER) 180 Minutes
WEIGHT	:	50:50
TOTAL MARKS	:	100

EXAMINER	:	DR. A. MANESCHIJN
MODERATOR	:	PROF. J. NOBRE
NUMBER OF PAGES	:	3 PAGES

REQUIREMENTS	:	ANSWER BOOKLETS NOTES - OPEN BOOK CALCULATOR

INSTRUCTIONS TO CANDIDATES:

- ANSWER ALL THE QUESTIONS
- **QUESTION 1 IS A COMPULSORY ELO QUESTION AND MUST BE ANSWERED. A MINIMUM OF 50% MUST BE ACHIEVED FOR THIS QUESTION**
- NO WRITTEN ANSWERS IN PENCIL WILL BE MARKED – **SKETCHES MAY BE DONE IN PENCIL OR PEN**
- ONE (1) MARK PER FACT

QUESTION 1 (Multi-disciplinary Practices): **[30]**
[NOTE: THIS IS A COMPULSORY ELO QUESTION AND MUST BE ANSWERED. A MINIMUM OF 50% MUST BE ACHIEVED FOR THIS QUESTION.]

A small-sized company called "Engineering Developers", is established to design and manufacture machine tool moulds used in plastic manufacturing facilities, and all the staff that are to be employed by the company are in some way involved in the whole product process. It is important to know what roles they play, and what contributions they make to the "team effort". Therefore, "Engineering Developers" will require numerous people with different skills and qualifications.

a) Draw a diagram to show the hierarchy of the structure of the company. Use your own titles that are appropriate for the company for each element - do not copy from elsewhere.
(15)

b) For each hierarchy element of the company structure that is part of the engineering function of the company, list the main skills and qualifications that would be required for the element and state why they would be required. Use a table to present your answers (first column is the hierarchy element, second column is the skills and qualifications).
(15)

QUESTION 2 (Design Process): **[20]**

You are the Project Engineer in a company that is developing two versions of a lawnmower. The one version is a petrol-engine lawnmower and the other is an electric motor lawnmower. You have a group of engineers, technologists and draughtsman (the persons producing the CAD drawings for the manufacture of the lawnmowers) reporting to you and you need to supervise the design, manufacture and testing of the two types of lawnmowers.

a) List the development steps, in a bullet list, from the time that you receive the project for the development of the lawnmowers up to where all design and drawing work is completed, the prototypes are manufactured, and the prototypes are tested.
(10)

b) Describe, by means of a flow diagram, how you would manage the design, manufacturing and testing processes from start to end.
(10)

QUESTION 3 (Systems Engineering Elements): [20]

For a standard motorcycle, use a hierarchy type block diagram to do a parts breakdown structure for the motorcycle. Give each block a number and a name to describe the item that the block refers to.

(20)

QUESTION 4 (Standards): [10]

a) Describe how a technical standard is used in engineering design.

(4)

b) List, in bullet format, the contents of an engineering standard for the design of a standard executive office chair.

(6)

QUESTION 5 (Welding): [20]

The fillet welds shown in the figure below hold a steel plate in place against a flat base plate (t = 5 mm). The steel plate is 6 mm thick and 40 mm high. The two fillet welds are along each corner of the plate as shown by the thick black lines. A torque of T = 100 Nm is applied to the plate.

The plate strength is R_m = 400 MPa.

Determine a suitable weld throat thickness a, and calculate the resulting "equivalent" stress in the welds.

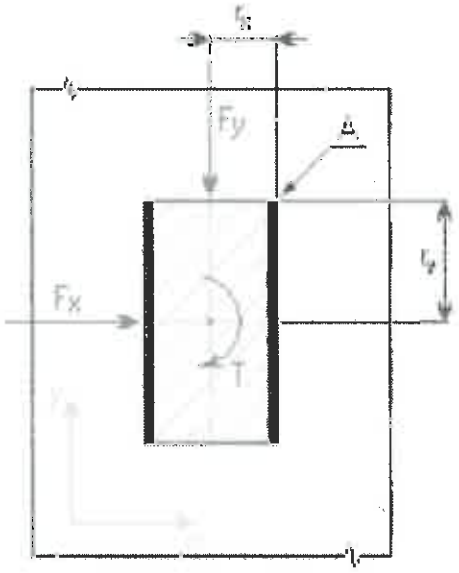

Fig. 5.1 Fillet Welds