



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN TECHNOLOGY (ELECTRICAL POWER ENGINEERING)(DEPE5)

EEP2303 : POWER ELECTRONICS 11.

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME: 2 HOURS

DATE: MAY 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Attempt **ANY THREE Questions**

Do not write on the question paper.

Question ONE

a) With the aid of a diagram, describe the effects of an inductive load in controlled rectification using an SCR.

(6marks)

(b) A half controlled single phase bridge rectifier with a commutating diode is supplied at 240V, 50Hz. If the load is highly inductive and taking a current of 10A;

- i. Draw the voltage and current output waveforms in the circuit at 90° firing angle
- ii. Determine the value of the overlap angle given that the supply inductance is 3mH and the firing angle is maintained at 90°

(7marks)

c) With the aid of a circuit diagram explain the following:

- i. Reversible three phase d.c motor control system employing SCRs
- ii. Dynamic braking

(7marks)

Question TWO

(a) (i) Explain the word “overlap” as used in three phase rectifier circuits.

(ii) Derive the expression of the overlap angle γ in three phase diode rectification

(6marks)

(b) (i) Draw the circuit diagram of a single phase cycloconverter using a centre tapped transformer and describe its operation

(ii) Draw the output waveforms of the circuit in b(i) above and hence derive the expression for its mean output voltage.

(9marks)

c) Explain why a three phase rectifier does not during the period of overlap.

(5marks)

Question THREE

(a) (i) Explain the FOUR basic elements of industrial robots

(ii) With the aid of a block diagram describe the CAPP(Computer Aided Part Program) system in a manufacturing industry

(8marks)

(b) (i) Explain the THREE main techniques used in programming industrial robots

(6marks)

(ii) State:

I. Any TWO advantages of computer aided design (CAD)

II. The main roles of the following in CAD:-

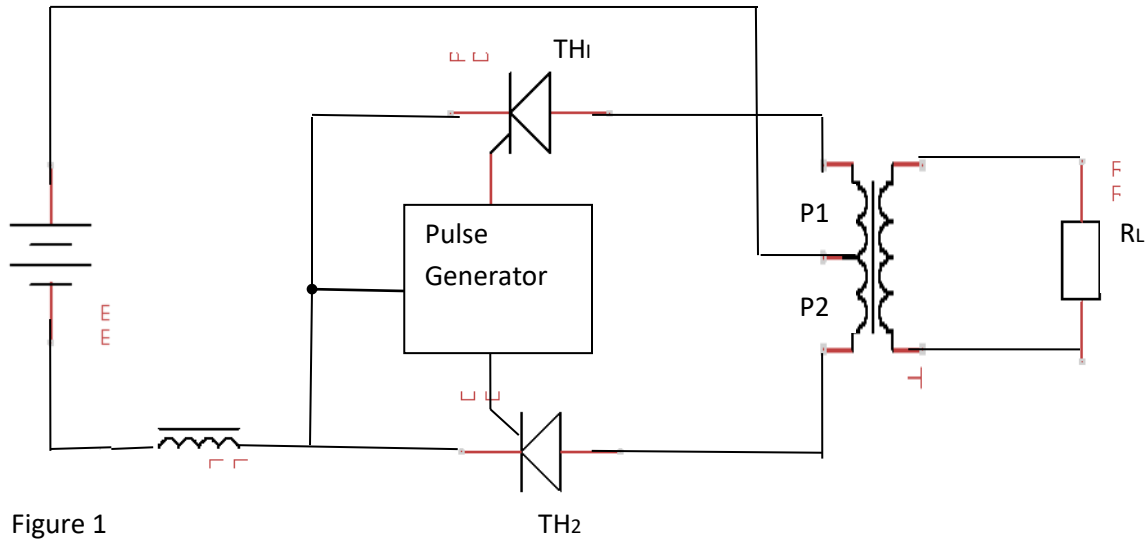
-Computer

- Designer

(6marks)

Question FOUR

(a) (i) Explain the operation of figure 1 circuit below:



(ii) Draw the output waveforms of the in a(i) above.

(9marks)

(b) (i) Draw the circuit of a Mc Murray Bedford inverter and describe its operation.

(ii) With the aid of a block diagram explain the operation of a variable d.c speed drive

(11marks)

Question FIVE

(a) Sketch the relationship of the characteristic impedance and the frequency of the following networks:

- i. π - filter
- ii. T-filter

(4marks)

(b) (i) For the T-section of figure 2 define the characteristic impedance Z_{OT} of the section and show that:-

$$\text{Cosh } P = 1 + \frac{Z_1}{2Z_2}$$

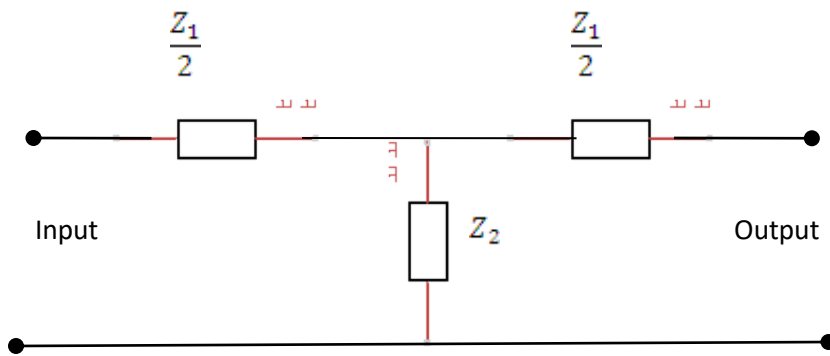


Figure 2

(ii) Deduce the relationship between the impedance of a symmetrical π -network and that of the equivalent T-network

(10marks)

c) For the circuit of figure 3 determine from the first principles the iterative impedance of the equivalent T-network for a frequency of 1kHz

(6marks)

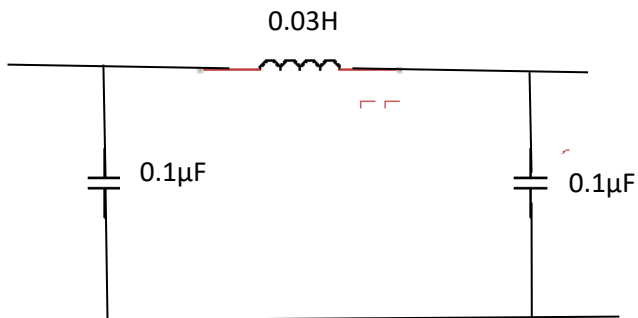


figure 3