TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN TECHNOLOGY (ELECTRICAL POWER ENGINEERING) (DEPE5)

EEE 2303 : POWER ELECTRONICS 11

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: DECEMBER 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)(i) Explain the importance of free wheeling diode in controlled rectification

(ii) With the aid of a diagram and waveform explain how the speed of a d.c motor can be varied using a thyristor. **(8marks)**

(b (i) Explain the principles of operation of an invertor by use of basic circuit.

(ii) Explain the operation of figure 1 circuit below:

(12marks)

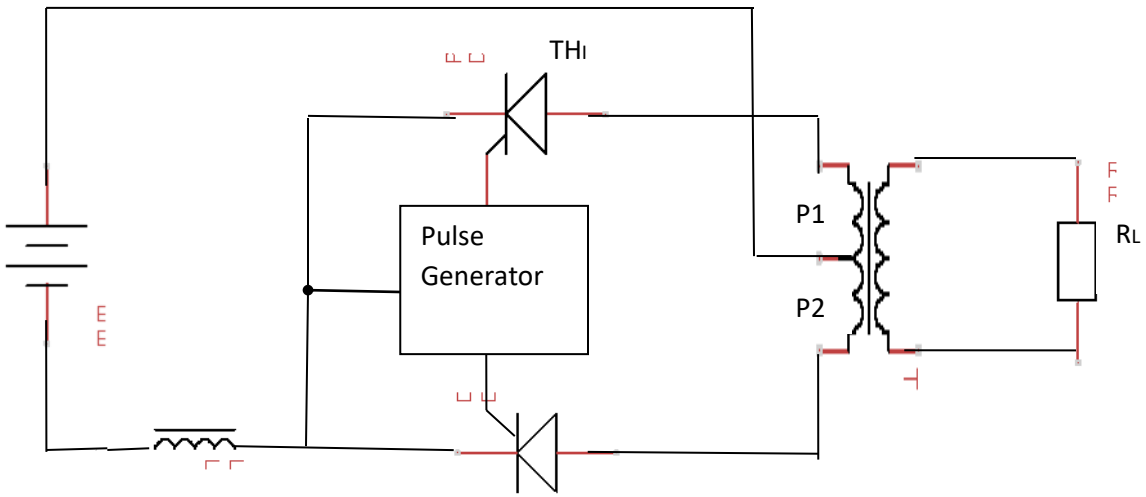

Figure 1

Question TWO

(a)(i) State any TWO advantages of using thyristor for motor speed control.

(ii) Draw a three phase controlled convertor circuit diagram and explain the process of regenerative breaking of a d.c motor. **(8marks)**

(b)(i) Explain the principle of operation of a basic D.C chopper circuit.

(ii)For the chopper circuit of figure 2 employing parallel-capacitor commutation and operating at 200Hz ,determine:-

I the thyristors T1 and T2 ratings

II its capacitor value

III the value of the inductance **(12marks)**

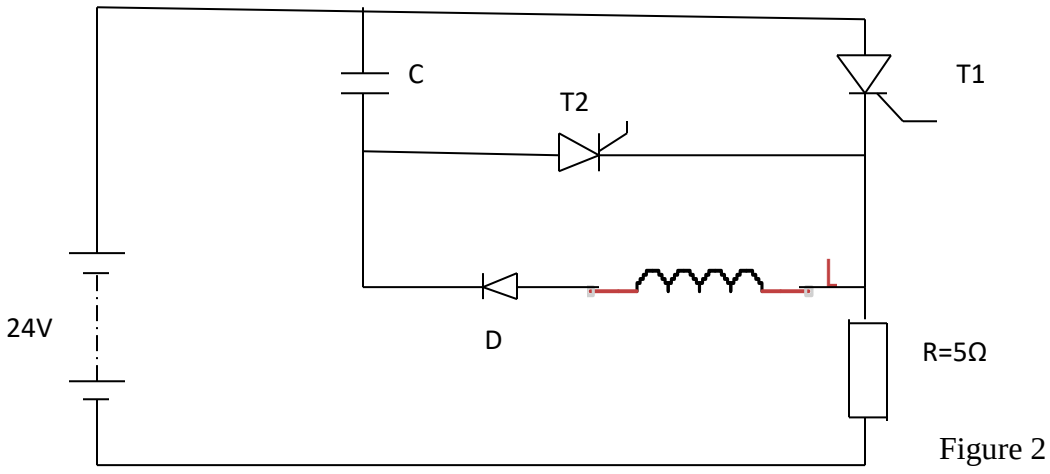

Figure 2

Question THREE

(a)(i) With the aid of a block diagram explain the structure of computer Aided Part Programming(CAPP) software in a manufacturing industry.
(ii)Explain the following types of robots
I Manufacturing robots
II Handling

(10marks)

(b) Explain the following CNC program features
(i) canned cycles
(ii)CNC program macro

c) With the aid of a labelled block diagram explain the operation of a numerically controlled machine.
(10marks)

Question FOUR

(a))(i)Explain the operation of the induction-motor speed control of figure 3 below.

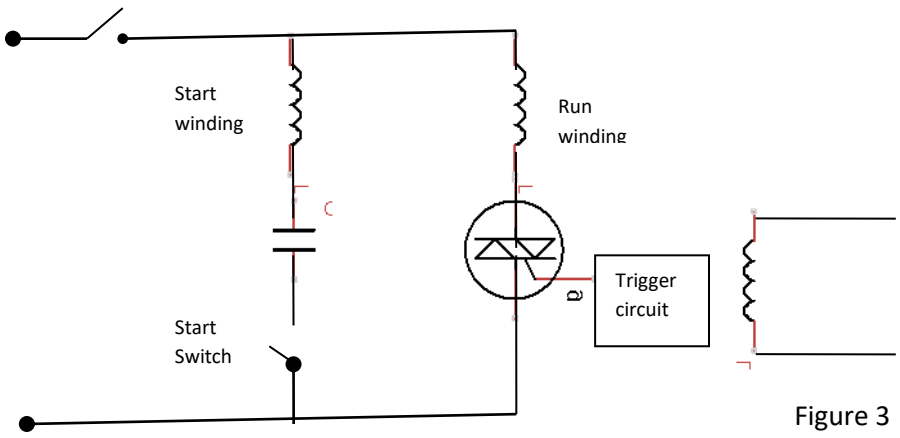

Figure 3

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

(9marks)

(b)(i) With the aid of a block diagram explain the speed control of an induction motor or synchronous motor by use of a cycloconvertor.

(ii) Explain the major limitation of using a cycloconvertor in speed control of motors in (b)(i) above

(7marks)

(c) An invertor supplies a 4-pole cage induction motor rated at 24rated at 240V,50Hz. If the motor speed is 900rev/s, Determine the invertor output frequency

(4marks)

Question FIVE

(a)(i) With the aid of a low pass T-filter section derive its characteristic impedance expression

(ii) Deduce the relationship between the impedances of a symmetrical π network and that of an equivalent T-network **(9marks)**

(b)(i) (i)Define the term "Insertion loss" for a filter transmission network

(ii) A constant K T-section filter consists of two series elements each of 60mH and a shunt capacitor of 0.1μF , Determine:-

I Its cut-off frequency

II Iterative impedance at 2kHz **(11marks)**