MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS

UNIVERSITY ORDINARY EXAMINATION

2021/2022 ACADEMIC YEAR

YEAR THREE SEMESTER 1(ONE) EXAMINATION FOR, OF DIPLOMA IN ELECTRICAL AND ELECTRONICS (POWER OPTION)

EEE066 – POWER ELECTRONICS

DURATION: 2 HOURS

DATE: 03/12/2021

TIME: 11:00AM – 1: 00PM

Instructions to candidates:

1. Answer question One and Any Other Two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

1. a) Explain the static characteristics of a thyristor. (3 marks)

b) With the aid of a sketch, illustrate the basic construction of a silicon controlled rectifier. (4 marks)

c) The highest potential of green energy is derived in form of d.c as opposed to A.C. Outline three advantages of A.C electrical energy as compared to d.c energy. (3 marks)

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d) Explain any three disadvantages of half-wave rectifier. (3marks)

e) With the aid of a sketch, illustrate the output of a half wave rectifier and state why it is not popularly applied. (4 marks)

f) Explain the term gate triggering as applied to thyristors. (3 marks)

g) Using a sketch, illustrate the operation of a mid step of cyclo converter. (6 marks)

h) A set up chopper has input voltage of 220V and output voltage of 660V. If the off time of the chopper is 100μs, determine the width of the output voltage. (4 marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

2. a) Outline the methods of generating biased mode of a thyristor. (2 marks)

b) i). With the aid of an I-V characteristic curve, explain the operation of an SCR. (4 marks)

ii) Describe the methods applied to turn off a thyristor. (4 marks)

c) i) Discus four methods applied to turning ON a thyristor. (4 marks)

ii) With the aid of a circuit diagram, explain the following methods of thyristor circuit connection.

I. Series connection

II. Parallel configuration

(4marks)

iii). Outline the necessity of the circuit connection of the modes illustrated Q2 C (ii) above. (2 marks)

QUESTION THREE (20 MARKS)

3. a) Explain any three applications of TRIACS. (2 marks)

b) With the aid of a sketch, describe the constructional features of TRIAC. (3 marks)

c) Using a V-I characteristics of a TRIAC, explain its different states. (7 marks)

d) Explain the constructional features between a power diode and a power transistor. (7 marks)

QUESTION FOUR (20 MARKS)

4. a) Explain the properties of a varactor diode. (2 marks)

b) Sketch the symbol and electrical equivalent circuit of a varactor diode. (3 marks)

c) Outline two disadvantages of a varactor diode. (2 marks)

d) With the aid of an I-V curve, illustrate the response of a veractor diode. (4 marks)

e) i). Outline three applications of a varactor diode. (3 marks)

ii) With the aid of a sketch, explain the construction of a veractor diode. (6 marks)