



College of Engineering Science and Technology (CEST)
School of Electrical and Electronics Engineering

ADVANCED DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING

EEE602 - ELECTRICAL TECHNOLOGY.

FINAL EXAMINATION - SEMESTER I - 2016. DURATION: 3 HOURS

DAY/DATE: APETT TIME: ASPETT. ROOM: APETT

INSTRUCTIONS TO STUDENTS:

1. You are allowed 10 minutes **EXTRA** as reading time during which you are **NOT** to write.
2. Begin each answer on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscap, graph paper, drawing paper, etc. in their correct sequence and secure with string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and you **MUST ATTACH** to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Answers to all questions must be written in **INK** on the Answer Sheet provided.
8. Diagrams and graphs can be drawn in pencil.
9. Non- programmable calculators are allowed.
10. Attempt all questions.

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SECTION - A [30 MARKS]

- Q1. (a) What is the significance of rectifying devices?
(b) With the aid of diagrams to show the characteristic and symbol of the PNP device; outline its behaviour briefly. (4 marks)
- Q2. Discuss the four sources of loss in power semi-conductor devices. (2 marks)
- Q3. For the circuit shown as Fig QA3, draw a fully labeled diagram to show the relative potential levels for every point. (5 marks)
- Q4. Outline any four markings on transformers. (4 marks)
- Q5. A feedback control system has an intrinsic gain of 7 and a feedback gain of 4.
(a) Draw a diagram to show the system.
(b) Work out the CLTF, and;
(c) Draw a single equivalent block of your finding (5 marks)
- Q6. Deduce the meaning of the numbers 1 and 11 on a clock face on transformer markings. (2 marks)
- Q7. Identify any two transducers that are commonly used in practice. (2 marks)
- Q8. With aid of diagrams identify the four standard types of input test signals used for transient response of an instrument. (2 marks)
- Q9. Draw a complete equivalent circuit of a practical transformer and label it. (4 marks)

SECTION - B [70 MARKS]

Q1. (a) With the help of diagrams outline the characteristics and operations of the following:

- (i) Diode
- (ii) Zener Diode
- (iii) Light Emitting Diode
- (iv) Variable Capacitance Diode

(8 marks)

(b) Draw a fully labeled diagram of the V-I characteristics of a thyristor.

(4 marks)

Q2. We wish to build a 140V, 30A dc power supply using a single-phase bridge rectifier and an inductive filter. The peak-to-peak current ripple should be about 15%. If a 50 Hz ac source is available, calculate the following:

- (a) The effective value of the ac voltage
- (b) The energy stored in the inductor
- (c) The inductance of the inductor
- (d) The peak-to-peak current ripple.

(10 marks)

Q3. A three phase bridge rectifier has to supply power to a 750 kW, 240 V dc load. If a 3300 V, 50 Hz, 3-phase feeder is available, calculate the following:

- (a) Voltage rating of the 3-phase transformer
- (b) DC current per diode
- (c) PIV across each diode
- (d) Peak to peak ripple in the output voltage and its frequency
- (e) The inductance of the smoothing choke required if the peak to peak ripple in the current is not to exceed 7 percent.

(10 marks)

Q4. (a) Fuses are used to protect the current, outline four of the necessary requirements.

(2 marks)

(b) What is a snubber network?

(1 mark)

Q5. The possible waveforms for the applied voltage and the resulting current are divided into two main groups. Discuss the groups and verify them diagrammatically.

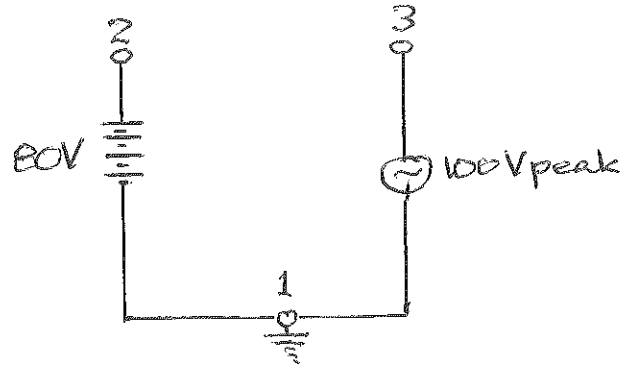
(10 marks)

- Q6. For the diagram shown as Fig QB6 simplify the block diagram and obtain the closed loop transfer function $C(s) / R(s)$.
(5 marks)
- Q7. (a) In the control system there is a need to boost or modify an electrical signal. Such modification requires the use of amplifying circuit. Hence for a Non – Inverting Amplifier component configuration:
(i) Draw the diagram
(ii) Work out the transfer function (5 marks)
- (b) A summing amplifier has the following configuration:
 $R_1 = 10$ kilo ohms
 $R_2 = 10$ kilo ohms
 $R_f = 100$ kilo ohms
If $V_1 = 0.3V$ and $V_2 = 0.5V$, what will be the output voltage?
(5 marks)
- Q8. (a) Three phase transformers need to be connected in parallel to boost the supply, hence what are the conditions to be met for such a practice?
(3 marks)
- (b) Identify any three properties of transformer oil. (3 marks)
- (c) With the aid of a diagram discuss the operation of a Buchholz relay.
(4 marks)

THE END

Appendix

1. Fig QA3



2. Fig QB6

