



MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (TELECOMMUNICATION AND INFORMATION TECHNOLOGY)

SPH222: ANALOGUE ELECTRONICS

DATE: 16/12/2021

TIME: 11.00-1.00 PM

INSTRUCTIONS:

This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

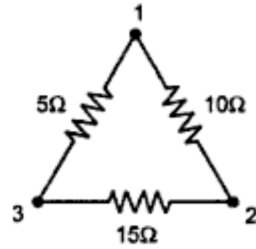
Write your college number on the answer sheet.

This paper consists of 3 printed pages

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

QUESTION ONE (COMPULSORY) (30MARKS)

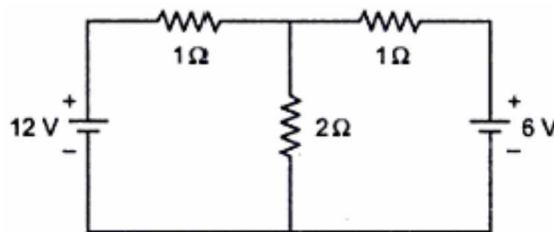
- a) Define the following terms as used in analogue electronics. (2 marks)
Current, Kirchhoff's current law (KCL), Kirchhoff's voltage law (KVL)
- b) Distinguish between the following terms: (3 marks)
- Electric current and charge
 - AC and DC
 - Dependent Sources and independent Sources
- c) Convert the given delta in figure below into equivalent star (3 marks)



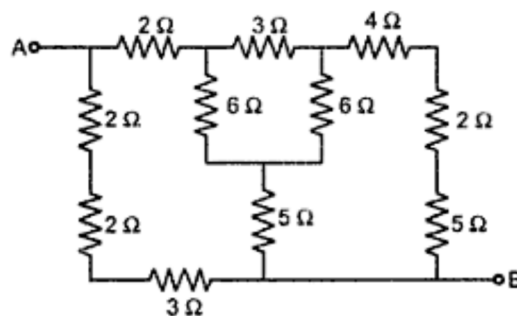
- d) Discuss briefly the importance of modulation factor in amplitude modulation. (2 marks)
- e) Explain the need of modulation in a communication model system. (4 marks)
- f) Discuss briefly various operational modes that are available in IC 555. (3 marks)
- g) Enlist the characteristic of an ideal op amp. (4 marks)
- h) Explain how an ideal op amp differ from real op amp on the aspect of DC imperfection (9 marks)

QUESTION TWO (20 MARKS)

- a) Using Thevenin's theorem, determine the current flowing through 2Ω resistance in the network given below. (8 marks)



- b) Calculate the effective resistance between point A and B in the given circuit below. (8 marks)



- c) Enlist the procedure used in Norton theorem analysis (4 marks)

QUESTION THREE (20 MARKS)

- a) Derive an expression for the efficiency for a full-wave rectifier. (10 marks)
- b) Explain the basic concept of Physical Operation of Enhancement MOSFET. (10 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the operation of transistor as an amplifier (6 marks)
- b) Explain the basic concept of IC 555 as Monostable multivibrator. (8 marks)
- c) Deduce an expression describing negative feedback in non-inverting amplifier (6 marks)

QUESTION FIVE (20 MARKS)

- a) Deduce an expression describe the analysis of amplitude modulation voltage. (4 marks)
- b) An AM wave is represented by the expression: $v = 5 (1 + 0.6 \cos 6280 t) \sin 211 \times 10^4 t$ volts (4 marks)
 - (i) What are the minimum and maximum amplitudes of the AM wave?
 - (ii) What frequency components are contained in the modulated wave and what is the amplitude of each component?
- c) Discuss four drawback that explain why AM modulation isn't reliable in the core of communication. (4 marks)
- d) Using a suitable block diagram, explain the principle of superheterodyne receive in AM communication systems. (8 marks)