INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

FACULTY OF ENGINEERING

END OF SEMESTER EXAMINATIONS - APRIL 2025

PROGRAMME: DIPLOMA IN ELECTRICAL AND CONTROL ENGINEERING

YEAR/SEM: YEAR 1/SEMESTER 1

COURSE CODE: DEE1104

NAME: ELECTRICAL ENGINEERING SCIENCE I

DATE: 2025-04-14

TIME: 9:00AM-12:00PM

INSTRUCTIONS TO CANDIDATES:

1. Read the instructions very carefully
2. The time allowed for this examination is STRICTLY three hours
3. Read each question carefully before you attempt and allocate your time equally between all the Sections
4. Write clearly and legibly. Illegible handwriting cannot be marked
5. Number the questions you have attempted
6. Use of appropriate workplace examples to illustrate your answers will earn you bonus marks
7. Any examination malpractice detected will lead to automatic disqualification.

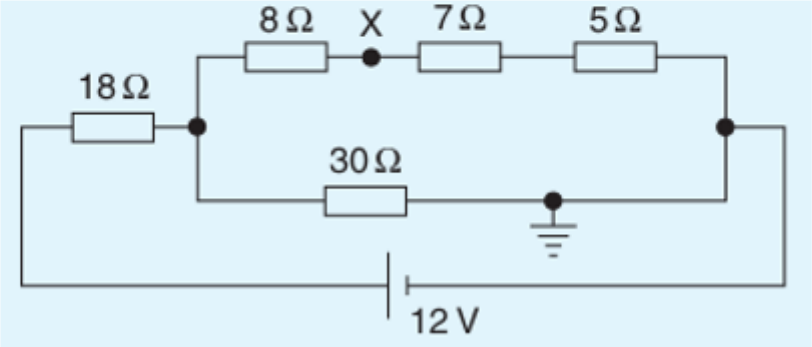
DO NOT WRITE ANYTHING ON THE QUESTION PAPER

Section A Attempt any 2 questions in Section A

Question 1:

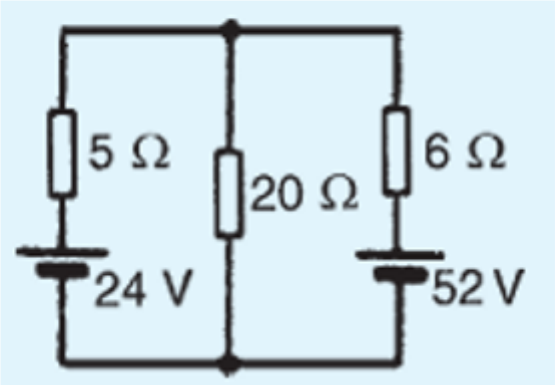
For the circuit shown in Figure, calculate

a. The current flowing through the 18Ω resistor (07 marks)
b. The voltage drop across the 7Ω resistor (06 marks)
c. The current through the 30Ω resistor (06 marks)
d. The power developed in the 8Ω resistor (06 marks)



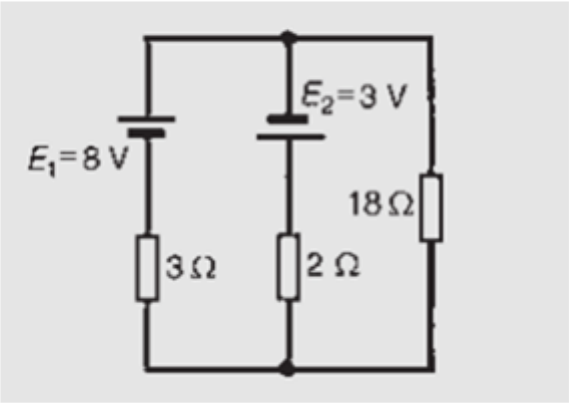
Question 2:

Use the superposition theorem to determine the current in each branch of the arrangement shown in Figure below. (25 marks)



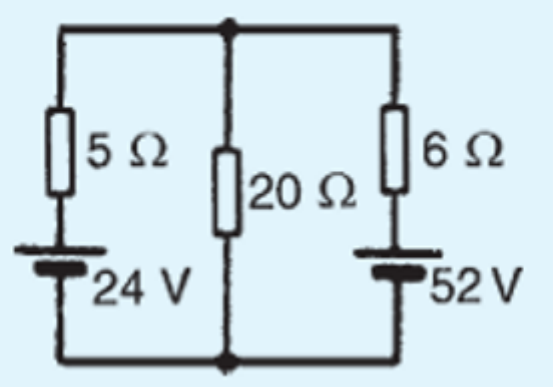
Question 3:

Use Superposition theorem to determine the current in through the 3**Ω**, 2**Ω** and 18**Ω** resistors



Question 4:

Use the superposition theorem to determine the current in each branch of the arrangement shown in Figure below. (25 marks)

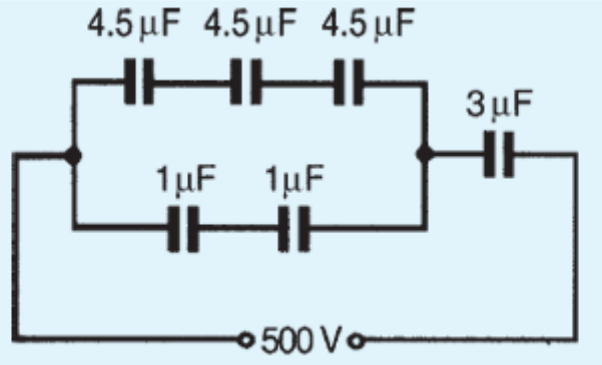


Section B Attempt any 2 questions in Section B

Question 1:

- 1.

a. Find the capacitance to be connected in series with a 10μF capacit equivalent capacitance to be 6μF.
b. For the arrangement of capacitors shown in Figure below
   Find
   i. The equivalent circuit capacitance
   ii. The voltage across a 4.5μF capacitor.



Question 2:

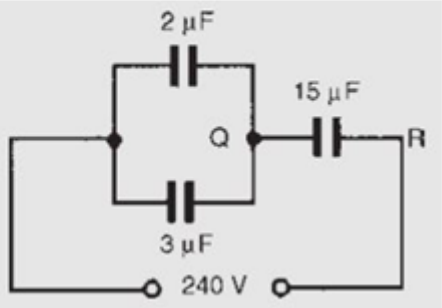
1. a. Define the following terms Electric field, Magnetic flux and magnetic flux density (06 Marks)
   b. Sketch a diagram of two bar magnets close to each other and indicate clearly all the poles and all magnetic field lines (03 Marks)
   c. Calculate the force between two point charges q1 = +16μC and q2 = +12μC separated by a distance of 6mm. (05 Marks)
   d. A direct current of 4A flows into a previously uncharged 20μF capacitor for 3ms. Determine the p.d. between the plates. (06 Marks)
   e. Two parallel rectangular plates measuring 200mm by 400mm carry an electric charge of 0.4μC. Calculate the electric flux density. If the plates are spaced 5mm apart and the voltage between them is 0.5kV, determine the electric field strength. (05 Marks)

Question 3:

Capacitances of 1μF, 3μF, 5μF and 6μF are connected in parallel to a direct voltage supply of 100 V.

a. Determine
   i. The equivalent circuit capacitance, (04 marks)
   ii. The total charge and (03 marks)
   iii. The charge on each capacitor (03 marks)

b. For the arrangement shown in Figure below find
   i. the equivalent capacitance of the circuit, (05 marks)
   ii. the voltage across QR (05 marks)
   iii. the charge on each capacitor (05 marks)



Question 4:

a. A magnetic pole face has a rectangular section having dimensions 200mm by 100mm. If the total flux emerging from the pole is 150μWb, calculate the flux density. (08 Marks)
b. A magnetizing force of 8000A/m is applied to a circular magnetic circuit of mean diameter 30cm by passing a current through a coil wound on the circuit. If the coil is uniformly wound around the circuit and has 750 turns, find the current in the coil. (07 Marks)
c. An iron ring of mean diameter 10cm is uniformly wound with 2000 turns of wire. When a current of 0.25A is passed through the coil a flux density of 0.4T is set up in the iron.
   Find (10 Marks)
      i. The magnetizing force
      ii. The relative permeability of the iron under these conditions.