FNU FIJI NATIONAL UNIVERSITY

COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: TRADE DIPLOMA IN ELECTRICAL ENGINEERING - STAGE 4

UNIT CODE: EEE535

TITLE: ELECTRO TECHNOLOGY

SUPPLEMENTARY ASSESSMENT – SEMESTER 1, 2017

TIME: 3 HOURS & 10 MINUTES
ROOM: AS PER TIMETABLE

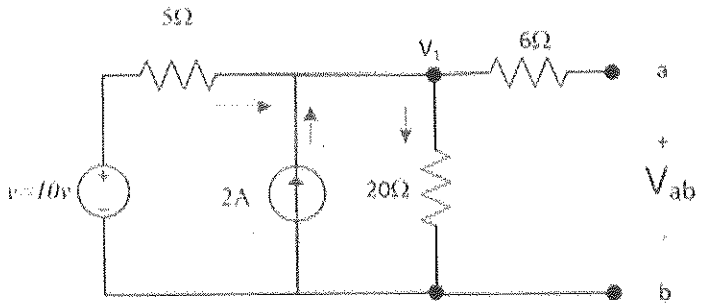
INSTRUCTIONS TO STUDENTS

1. You are allowed **10 minutes** extra **reading time** during which you are NOT to write.
2. Begin each SECTION 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 foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. ANSWER ALL QUESTIONS
9. Show all working where necessary.
10. ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM.

Attempt all the questions.

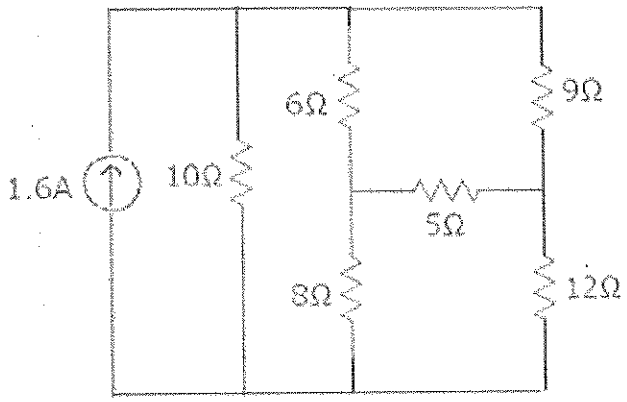
Question 1

a) Find the Thévenin equivalent of the circuit. (10 marks)



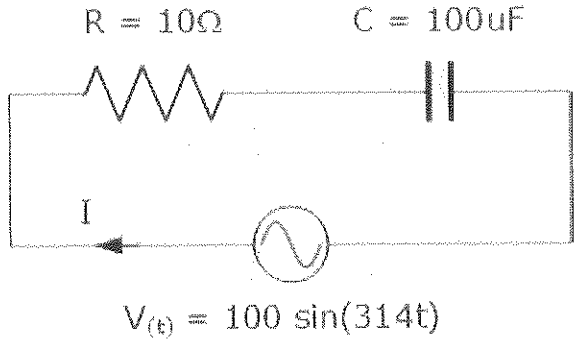
Question 2

Find the current through 5Ω resistance in the given network by using Mesh Method? (10 marks)



Question 3

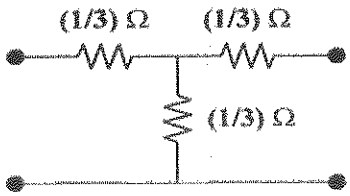
A capacitor which has an internal resistance of 10Ω's and a capacitance value of 100uF is connected to a supply voltage given as $V_{(t)} = 100 \sin (314t)$. Calculate the current flowing into the capacitor. Also construct a voltage triangle showing the individual voltage drops.



(10 marks)

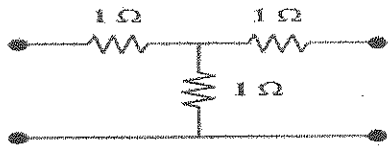
Question 4

Determine the Y parameters for the following circuit. (10 marks)



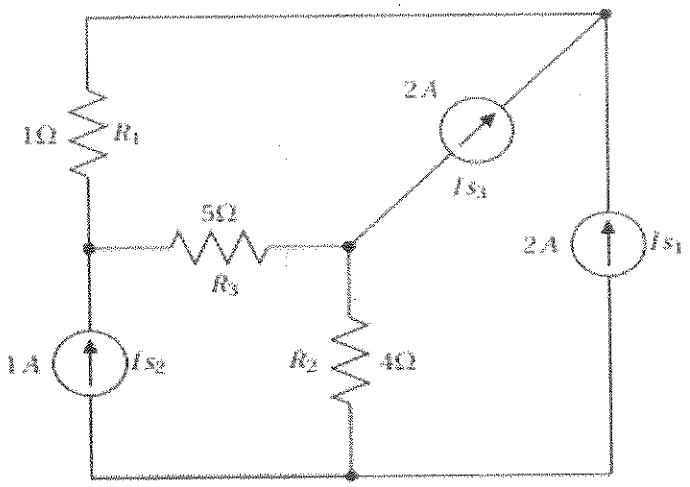
Question 5

Determine the Z parameters for the following circuit. (10 marks)



Question 6

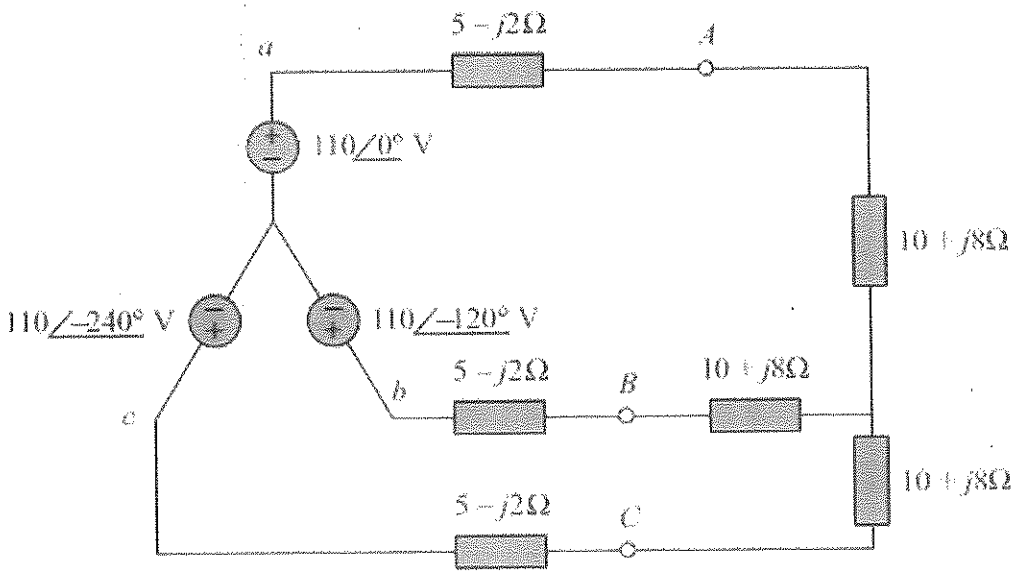
Use nodal analysis to solve the circuit shown below and determine Va.



(10 marks)

Question 7

a) Calculate the line currents in the three wire Y-Y system in the figure shown below.



(5 marks)

b) A balanced 230 volt (rms) three phase source is furnishing 6 kVA at 0.83 pf lagging to two Δ - connected parallel loads. One load is a purely resistive load drawing 2 kW. Determine the phase impedance of the second load. (5 marks)

Question 8

Find the Laplace transforms of the given functions.

a) $g(t) = 4\cos(4t) - 9\sin(4t) + 2\cos(10t)$ (3 marks)

b) $f(t) = t^2 e^{-2t}\cos(3t)$ (4 marks)

c) $f(t) = [\cos(3t)]^2$ (3 marks)

Question 9

a) Find the inverse Laplace transform of $F(s) = \dfrac{1}{s^2 + 3s + 2}$ (5 marks)

b) Find the inverse Laplace transform of $G(s) = \dfrac{86s - 78}{(s+3)(s-4)(5s-1)}$ (5 marks)

Question 10

a) Determine the efficiency and regulation of the transformer when it delivers 7.2 kVA at $V_2 = 120V$ and power factor of:

(i) 0.8 lagging (4 marks)

(ii) 0.8 leading (3 marks)

(iii) For a given load voltage and power factor it can be shown that the efficiency of a transformer attains its maximum value at the kVA load level which makes the I^2R winding losses equal to the core loss. Using this result, determine the maximum efficiency of the above transformer at rated voltage and 0.8 power factor and the kVA load level it occurs. (3 marks)

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