FNU FIJI NATIONAL UNIVERSITY
College of Engineering, Science & Technology

SCHOOL OF ELECTRICAL & ELECTRONICSENGINEERING

TRADE DIPLOMA IN ELECTRICAL ENGINEERING (ELECTRICAL& ELECTRONIC MAJORS)

EEE466 – CIRCUIT ANALYSIS

FINAL EXAMINATION – TRIMESTER - 1, 2015

DAY/DATE: MONDAY, 28/04/2015: TIME : 2 - 4.10 PM
ROOM: J/NARAIN COLLEGE HALL

INSTRUCTION TO STUDENT

1. You are allowed 10 minutes extra reading time during which you are **NOT** to write.

2. **ALL QUESTIONS TO BE ANSWERED** on a fresh page and use both sides of the sheet.

3. Write your candidate number at the top of each answer & attached sheet.

4. Insert all written foolscaps, graph 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 you must attach all of them to your answer scripts.

6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.

7. Tables & formula on the Appendix.

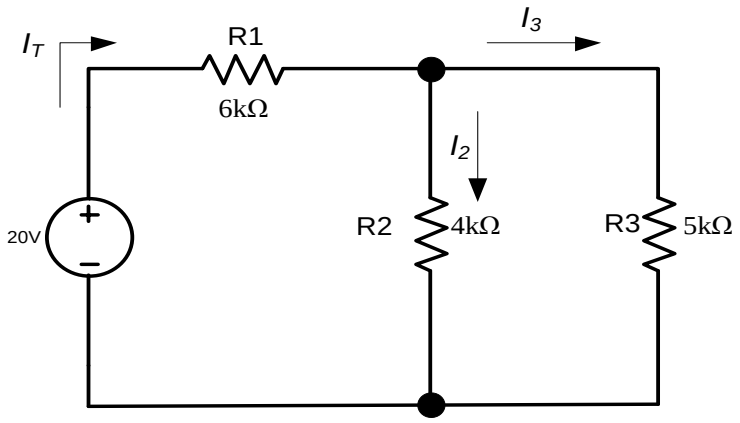
8. **SECTION A. - ATTEMPT ALL QUESTIONS;**
   SECTION B – select your options(pick any 2 from the 5 Question)

Section – A: - Compulsory Section - Answer all question in this section

Question 1

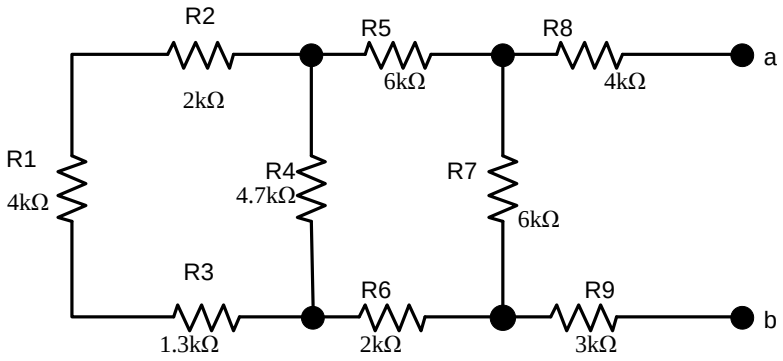
(A). In the series/parallel circuit below, calculate the current flowing through each branch of the circuit in figure below….

(6 marks)

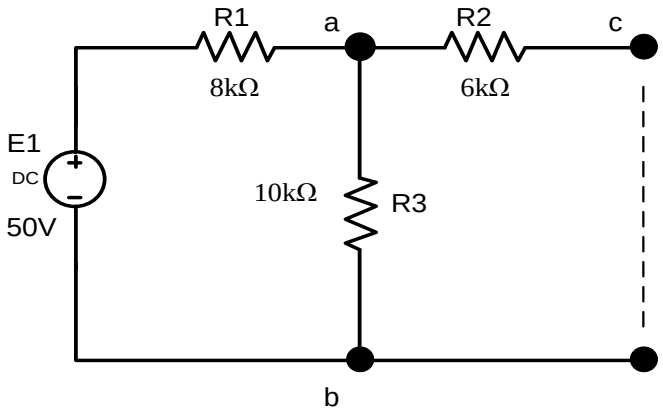


(B). A resistive circuit is given below. Workout the:

i) the *Req* between terminal a and b . (4 marks)



(C). For the series/parallel resistive circuit below, find out:



i) The voltage across each resistor using voltage divider method. (4marks)
ii) The current through the circuit. (1mark)
iii) If there is a short between points **c-b**, work out the current through each resistor using current divider method. . (3marks)
iv) The current through the circuit if points **a-b** is shorted. (2marks)

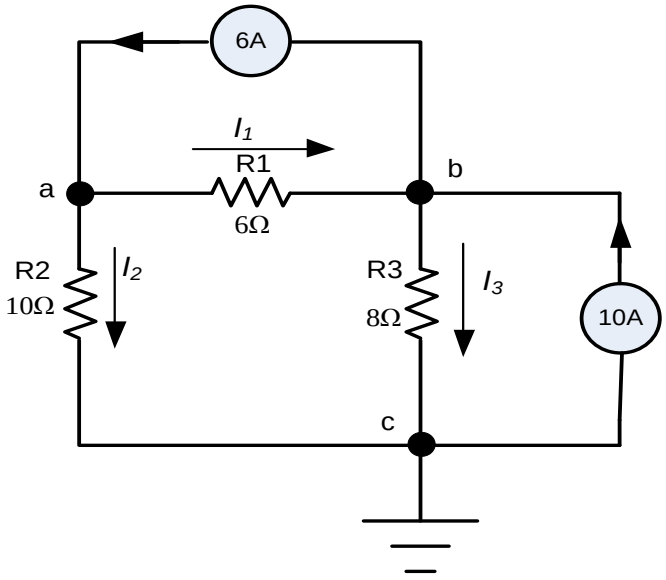
[Total 20 marks]

Question 2

Using Nodal Analysis method:

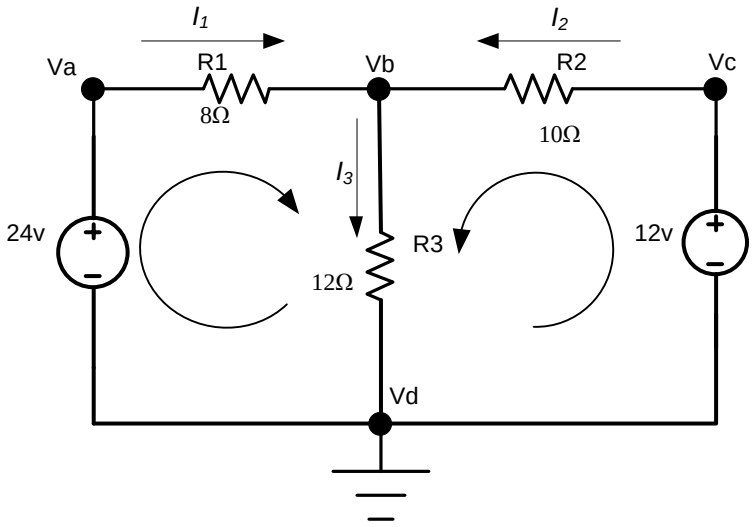
(A). Find the voltage at node “a” & node “b” in a circuit given below.

(10 marks)



(B). Find the current in a 12Ω resistor in a circuit below.

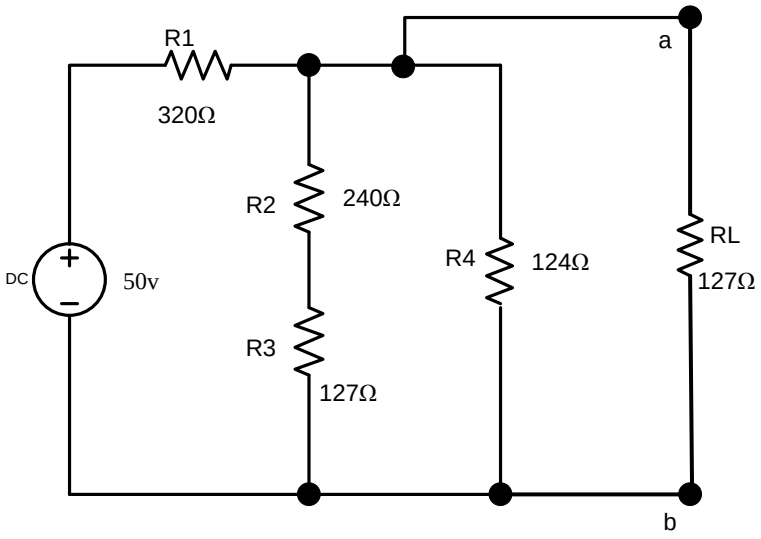
(10 marks)



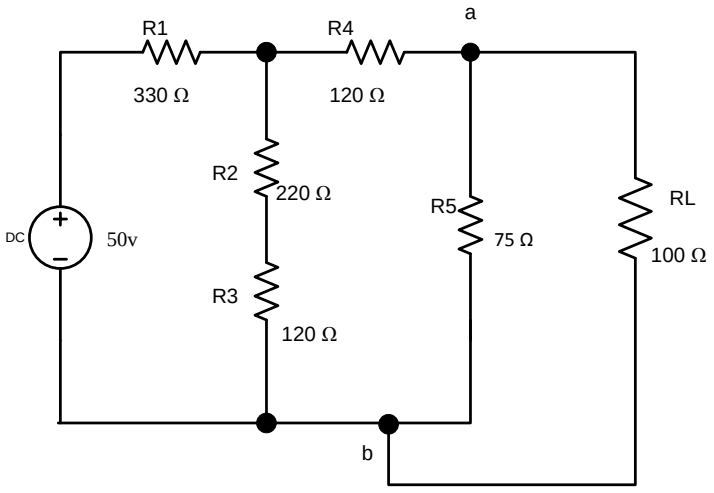
[Total: 20marks]

Question 3

(A). From the circuit given below, determine Thévenin's equivalent circuit and calculate the current through the 127Ω load resistor. **(10 marks)**



(B). For the circuit shown below, calculate and determine the Norton equivalent circuit. **(10 marks)**



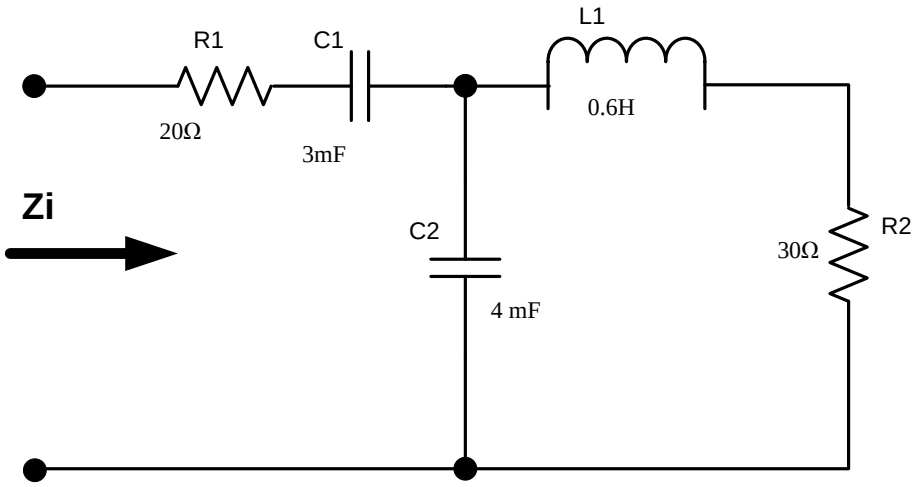
[Total: 20 marks]

Section – B: Select ONLY any BEST two(2) question from the 5 questions given.

Question 1

Use complex algebra application to:-

i. Determine the input impedance of the circuit shown below. (*w =10 rad/s)*
ii. Plot its phasor diagram



[20 marks]

Question 2 [20 marks]

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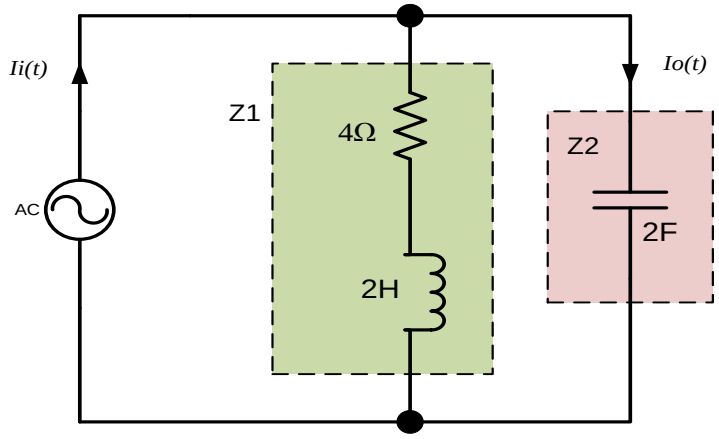
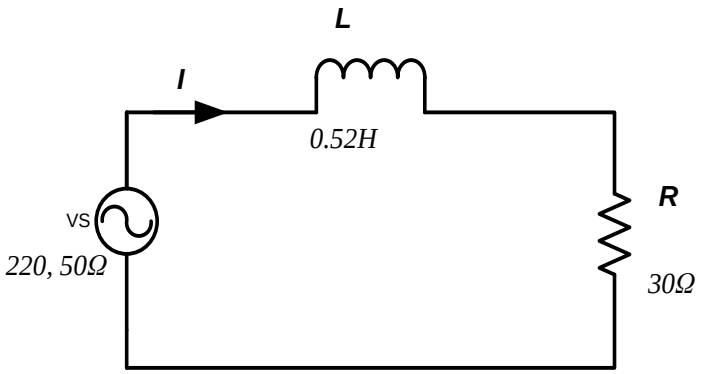
(A). For the circuit below, show the calculation of the **Gain = I_O (w) / I_I(w)** and its **poles** and **zeroes**.

(10 marks)



(B). The circuit shown below is connected to 220V, 50Hz supply. Determine the impedance of the circuit, and its phase angle?

(6 marks)



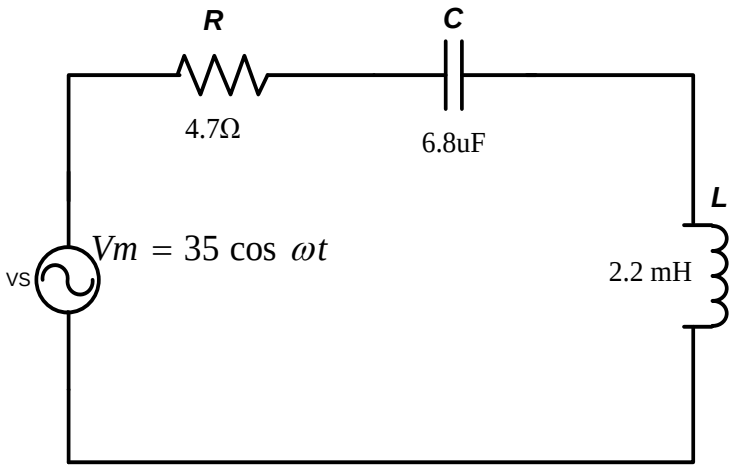
(C). The voltage across a 1-uF Capacitor is given as *v = 30 sin 400t*. What is the sinusoidal expression for the current? and Sketch the v and i curves.

(4 marks)

[Total: 20marks]

Question 3 [20 marks]

For the RLC circuit below, $\pi = 3.14$,



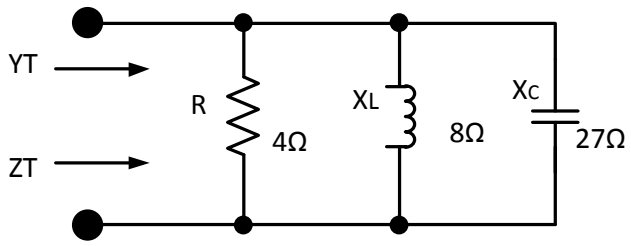
Show ALL calculation by determining the following:-

a) The resonant frequency (2 marks)
b) Half power frequency (6 marks)
c) Quality Factor (4 marks)
d) Bandwidth (3 marks)
e) Current Amplitude of ω_0, ω_1, ω_2 (5 marks)

[Total:20 marks]

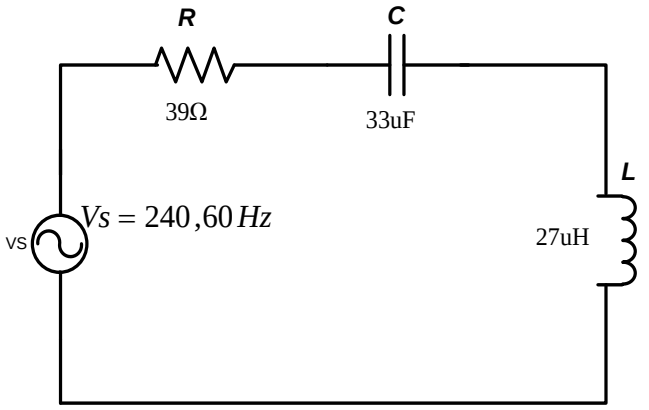
Question 4 [20 marks]

(a). For the parallel RCL network below, use the complex number system (rectangular or polar form) format to:-



(i)	Find the Admittance of each parallel circuit	(3 marks)
(ii)	Determine the input Admittance.	(2 marks)
(iii)	Calculate the input Impedance	(2 marks)
(iv)	Draw the admittance diagram	(3 marks)

(b). A resistor of 39Ω is connected in series with a capacitor of 33uF and an inductor of 27uH connected to a Ac supply of 240 with 60Hz.



From the circuit above, calculate the following?.

(i)	Find the impedance of the circuit	(3 marks)
(ii)	Phase Angle	(2 marks)
(iii)	Current flowing through the circuit.	(3 marks)

(c). Write down the four types of dependent power sources. (2 marks)

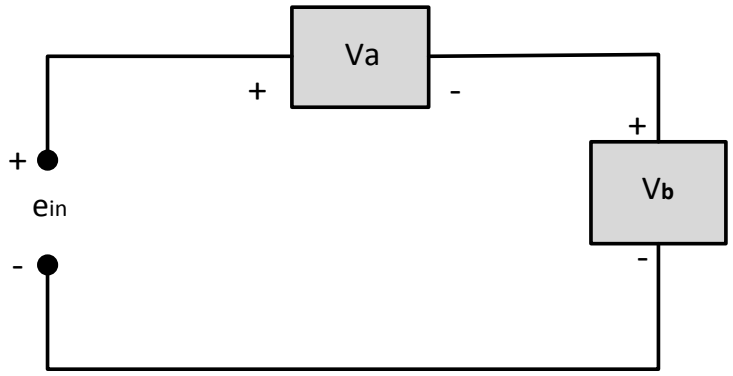
[Total:20 marks]

Question 5 [20 marks]

(a). Using the phasor voltage method, find the input voltage (e_{in}) of the circuit below, with a frequency f = 50 Hz if:-

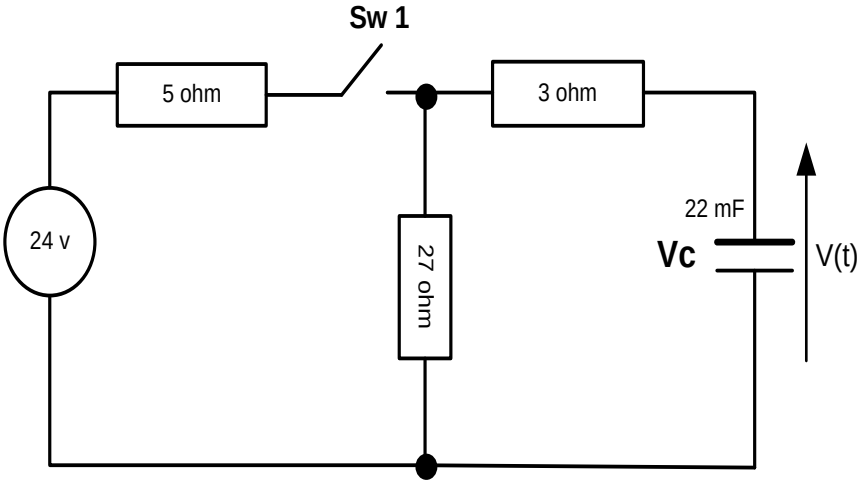
$$v_a = 60 \sin(377t + 40^0) \text{ and } v_b = 20 \sin(377t + 65^0)$$

(10 marks)



(b). For the circuit shown below, the switch below has been closed for a long time and is open at t = 0. Find the V(t) for t ≥ 0. Calculate the initial energy stored in the capacitor.

(10 marks)



[Total:20 marks]

----------**THE END** ----------

Appendix 1

Formulas

1. $w_x = R/2L + \sqrt{(R/2L)^2 + 1/LC}$

2. $w_y = -R/2L + \sqrt{(R/2L)^2 + 1/LC}$

3. $f_0 = 1/2\pi\sqrt{LC}$

4. $Q = \dfrac{1}{w_0 CR}$

5. $B = w_0{}^2\, CR$

6. $X_L = 2\pi fL$

7. $\omega_0 = 2\pi f_o$

8. $X_C = \dfrac{1}{2\pi fC}$

9. $I_D = I_{DSS}\left(1 - \dfrac{V_{GS}}{V_P}\right)^2, \qquad \beta_1\left[(V_{DD} - 2V_T)V_{ON} - 0.5^2{}_{ON}\right]$

10. $f_H = \pm\dfrac{8\,fo}{Vc}, \qquad V_{DS} = V_{DD} - I_D R_D$

Appendix 2

Filter Coefficients

SECOND-ORDER	BESSEL	BUTTERWORTH	3-dB TSCHEBYSCHEFF
a_1	1.3617	1.4142	1.065
b_1	0.618	1	1.9305
Q	0.58	0.71	1.3
R_4/R_3	0.268	0.568	0.234

. Second-Order Filter Coefficients

Tschebyscheff Coefficients

n	i	a_i	b_i	$k_i = f_{Ci} / f_C$	Q_i
1	1	1.0000	0.0000	1.000	—
2	1	1.3614	1.3827	1.000	0.86
3	1	1.8636	0.0000	0.537	—
	2	0.0640	1.1931	1.335	1.71
4	1	2.6282	3.4341	0.538	0.71
	2	0.3648	1.1509	1.419	2.94
5	1	2.9235	0.0000	0.342	—
	2	1.3025	2.3534	0.881	1.18
	3	0.2290	1.0833	1.480	4.54
6	1	3.8645	6.9797	0.366	0.68
	2	0.7528	1.8573	1.078	1.81
	3	0.1589	1.0711	1.495	6.51
7	1	4.0211	0.0000	0.249	—
	2	1.8729	4.1795	0.645	1.09
	3	0.4861	1.5676	1.208	2.58
	4	0.1156	1.0443	1.517	8.84
8	1	5.1117	11.9607	0.276	0.68
	2	1.0639	2.9365	0.844	1.61
	3	0.3439	1.4206	1.284	3.47
	4	0.0885	1.0407	1.521	11.53
9	1	5.1318	0.0000	0.195	—
	2	2.4283	6.6307	0.506	1.06
	3	0.6839	2.2908	0.989	2.21
	4	0.2559	1.3133	1.344	4.48
	5	0.0695	1.0272	1.532	14.58
10	1	6.3648	18.3695	0.222	0.67
	2	1.3582	4.3453	0.689	1.53
	3	0.4822	1.9440	1.091	2.89
	4	0.1994	1.2520	1.381	5.61
	5	0.0563	1.0263	1.533	17.99