



FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY  
SCHOOL OF ELECTRICAL & ELECTRONIC

ENGINEERING

TRADE DIPLOMA IN ELECTRICAL ENGINEERING  
STAGE 5

EEE571-ELECTRICAL POWER NETWORKS & THEOREMS

TRIMESTER 2 - 2017.

Total marks-100%-----Duration: 3Hrs 10 Minutes

DAY/DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ ROOM: As per timetable.

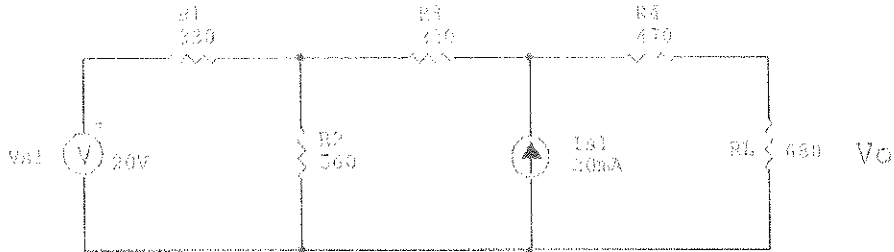
INSTRUCTIONS TO STUDENTS

1. You are allowed 10 minutes Extra reading time during which you are NOT to write.
2. Begin each 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 sheets in their correct sequence and secure with string.
5. For all sheets of paper on which rough/draft work has been done, cross it though 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. Answer all Questions
8. Show all workings where necessary.
9. Do not use programmable calculators, especially the ones that does the conversions of number systems.
10. **CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!**

Attempt all the questions

Question 1

a) Reduce the circuit shown to its Thevenin and Norton equivalent circuits.



(15 marks)

b) For the circuit shown above find  $V_0$

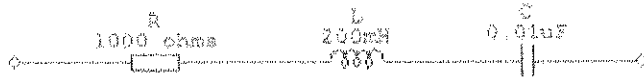
(5 marks)

c) Find Maximum power for the above

(5 marks)

Question 2

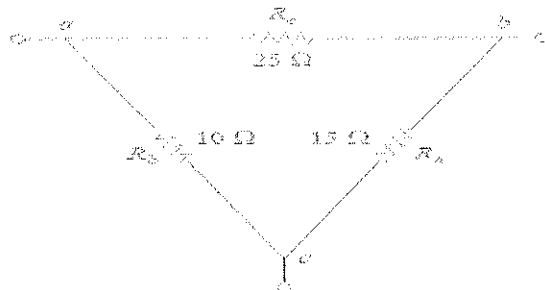
Calculate the voltage applied across the circuit given below if, at a frequency of 2000Hz, 2V are dropped across the 1000 ohms resistance.



(5 marks)

Question 3

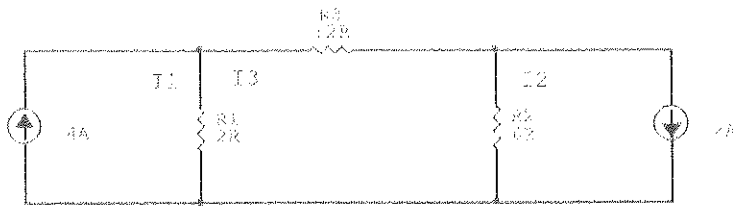
Convert the delta network shown below to an equivalent star network



(5 marks)

Question 4

Use Nodal Analysis to solve for the unknown currents in the circuit below

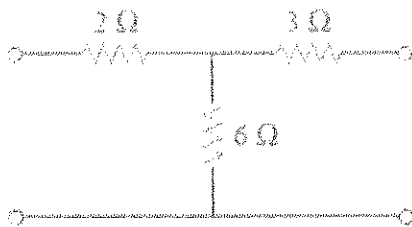


(10 marks)

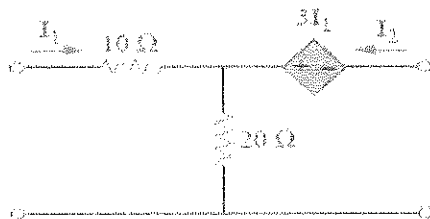
Question 5

a) Given the following circuit. Determine the hybrid parameters

(10 marks)



b) Find the transmission parameters for the two-port network and Maximum power (15 marks)



Question 6

Determine the phase sequence of the set of voltages.

$$V_{an} = 200 \cos(\omega t + 10^\circ)$$

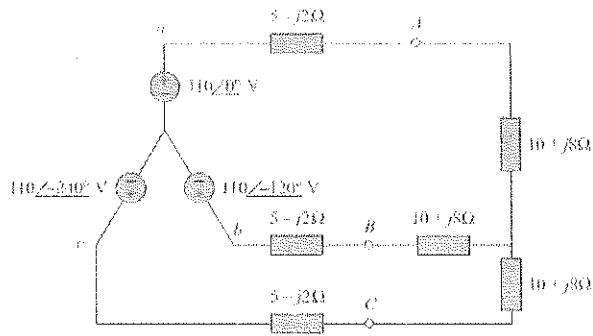
$$V_{bn} = 200 \cos(\omega t - 230^\circ)$$

$$V_{cn} = 200 \cos(\omega t - 110^\circ)$$

(5marks)

Question 7

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



(10 marks)

Question 8

Determine the Laplace Transform of each of the following functions.

a)  $t^2 - 2t$

(1 marks)

b)  $(t^2 - 3)^2$

(2 marks)

c)  $\cos 2\pi t$

(2 marks)

Question 9

Find the inverse Laplace transform of  $F(s) = \frac{1}{s^2 + s - 2}$

(10marks)

-----THE END-----

### A: LAPLACE TRANSFORM OF COMMON FUNCTIONS

Time Functions $f(t)$	Laplace Transform $L\{f(t)\} = F(s)$
$u(t)$ , unit step. $u(t) = 1$	$1/s$
$t$ , unit ramp	$1/s^2$
$t^n$	$n! / s^{n+1}$
$e^{-at}$	$1 / (s + a)$
$\cos \omega t$	$s / (s^2 + \omega^2)$
$\sin \omega t$	$\omega / (s^2 + \omega^2)$
$e^{-at} \cos \omega t$	$(s + a) / [(s + a)^2 + \omega^2]$
$e^{-at} \sin \omega t$	$\omega / [(s + a)^2 + \omega^2]$

### B: LAPLACE TRANSFORM OPERATORS

Operation	Time Domain	Laplace Domain
Final Value theorem	$\lim_{t \rightarrow \infty} f(t)$	$\lim_{s \rightarrow 0} sF(s)$
Initial Value theorem	$\lim_{t \rightarrow 0} f(t)$	$\lim_{s \rightarrow \infty} sF(s)$
First Derivative	$\frac{d}{dt} f(t)$	$sF(s) - f(0)$
2 <sup>nd</sup> Derivative	$\frac{d^2}{dt^2} f(t)$	$s^2 F(s) - sf(0) - \frac{df(0)}{dt}$
n <sup>th</sup> Derivative	$\frac{d^n}{dt^n} f(t)$	$s^n F(s) - \sum_{r=1}^n \frac{d^{r-1}}{dt^{r-1}} f(0) s^{n-r}$
Complex Shift theorem	$e^{-at} f(t)$	$F(s + a)$
First Integral	$\int_0^t f(t) dt$	$(1/s)F(s)$
Multiplication by $t$	$t f(t)$	$-\frac{d}{ds} F(s)$
Division by $t$	$\frac{1}{t} f(t)$	$\int_s^\infty F(s) ds$