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EE101 INTRODUCTION TO ELECTRICAL ENGINEERING
FIRST SEMESTER 2014-15

ASSIGNMENT 2

QUESTION 1. A resistive circuit driven by a current source is shown in Fig 1.

i. Draw the oriented graph denoting the edges as numbered I the Figure

ii. Answer the following with respect to the graph:
   a. Are 12, 123, 23, 34, 13, 234 trees? Give reasons
   b. Are 123, 234, 14 , 124, circuits ? Give reasons

iii. Write the complete incidence matrix A_c . Take node c as the reference node and write the reduced incidence matrix A.

iv. Taking 34 as the tree write down the fundamental circuit matrix B_f

v. Check $AB_f^T = 0$

vi. Write KCL equations using A

vii. Write KVL equations using B_f

viii. Find all currents through and voltages across the network elements $R_2 = 2$ ohms, $R_3 = 3$ ohms and $R_4 = 4$ ohms and also the current source assume I = 1 amp

ix. Check Tellegen's Theorem

x. Now remove the current source and replace it by a voltage source E_s of 1 volt. Repeat Viii and IX

xi. Change $R_2 = 4$ ohms, $R_3 = 2$ ohms and $R_4 = 1$ ohm and repeat viii with voltage source E_s of 1 volt

xii. Now we have three sets of voltages and currents as per viii, x , xi. Take a voltage set from one and current set from any other and show that Tellegen is valid!

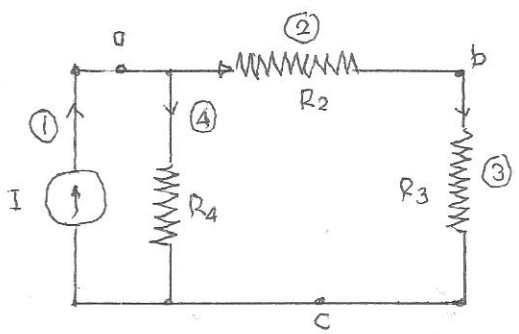
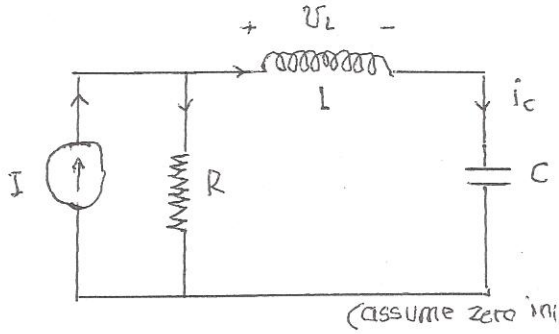


FIG 1



(assume zero initial condition

FIG 2