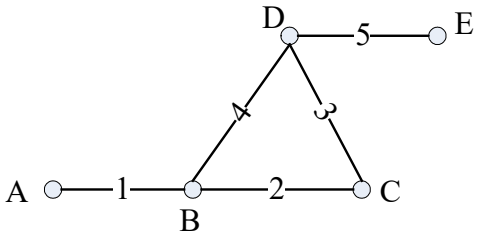
L#18 Review Questions Solution (ECE454/544)

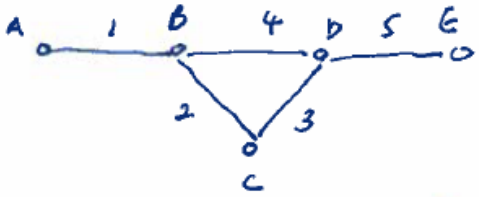
1. You are to evaluate the *two-terminal reliability between A and E* in the network shown in the following figure. All nodes are perfectly reliable. All edges fail independently with a fix probability of 0.1.
   a. Find all the minimal cut sets of the network
   b. Find all the minimal tie sets of the network
   c. Find the two-terminal reliability between A and E using the **graph transformation method**



a) cut sets: $C_1=\{1\}$ $C_2=\{2,4\}$ $C_3=\{3,4\}$ $C_4=\{5\}$

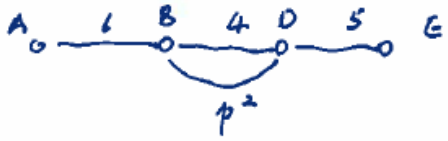
b) tie sets: $T_1=\{1,4,5\}$ $T_2=\{1,2,3,5\}$

c)

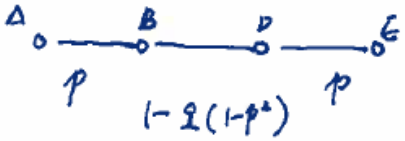


$p=0.9$ $q=0.1$

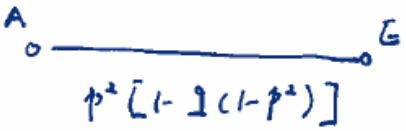
series trans 2-3:



parallel:



series:



$$R_{AE}=p^2[1-q(1-p^2)]=0.7946$$

Verification: $R_{AE}=Pr\{T_1\cup T_2\}=Pr(T_1)+Pr(T_2)-Pr(T_1\cap T_2)$

$$=p^3+p^4-Pr\{1,2,3,4,5\}$$

$$=p^3+p^4-p^5=0.7946$$