Electric Circuits: 1st-Midterm Exam 2018/10/15

1. (14%) Please give the answer for the following statements. State your reasoning.

   (1) In a series circuit, each resistor has the same voltage.

   (2) For a graph, what is a tree? A tree is also a loop. (true or false)

   (3) A network with a branches, and b independent loops, and c nodes will satisfy the fundamental theorem of network topology: $a = b + c - 1$. (true or false)

   (4) Kirchhoff's current law can state that the algebraic sum of currents entering a closed boundary is zero. (true or false)

   (5) Nodal analysis applies KCL to find unknown currents in a given circuit, while mesh analysis applies KVL to find unknown voltages. (true or false)

   (6) A mesh is a dependent loop. Also, the mesh current is equal to the branch current. (true or false)

   (7) In many circuit applications, components are connected together in one of two ways to form a three-terminal network: the "Delta" configuration, and the "Wye" configuration. Please plot two circuits to represent the "Delta" and "Wye" configuration, respectively.

2. (5%) The current that enters an element is shown in Fig. 1. Find the charge $q(15)$.

200 + 5×10 + 5×3 = 200+75

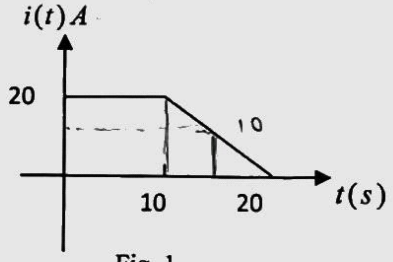

Fig. 1

3. (12%) For the circuit in Fig. 2, (1) if $R = \frac{1}{2}\Omega$, then how much the power will be absorbed by the R ; (2) find the resistance R so that the power absorbed by R is equal to that of the voltage source 4Vdelieved.

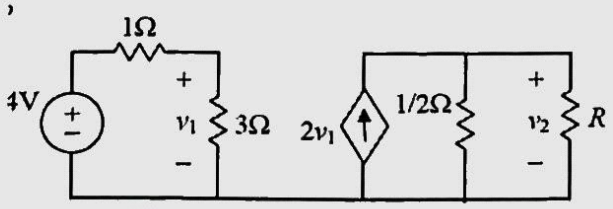

Fig.2

4. (15%) For the circuit in Fig. 3, please transfer the network into a graph, and find the nodes, braches, loops, meshes and its adjacency matrix A.