Department of ECE, Bennett University

EECE105L: Fundamentals of Electrical and Electronics Engineering

Tutorial Sheet-9

Topics Covered: Mesh and Nodal Analysis

1. Consider the circuits shown in fig. 1 through fig. 6. Using Nodal analysis, solve for currents and voltages across all the resistances in a given circuit.

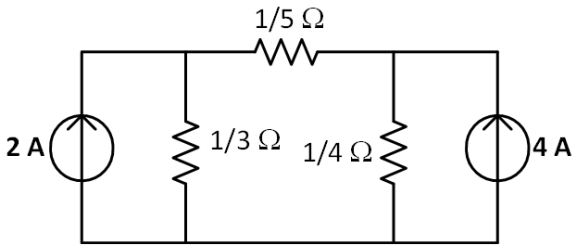

Fig. 1

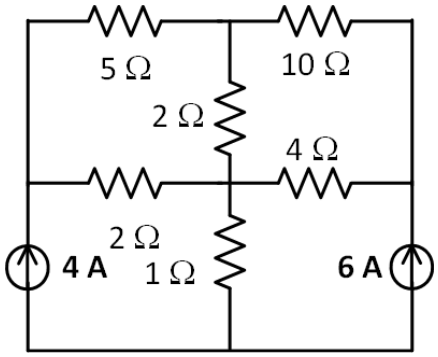

Fig. 2

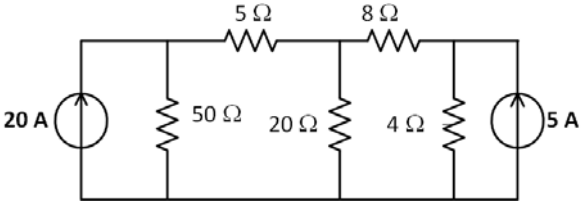

Fig. 3

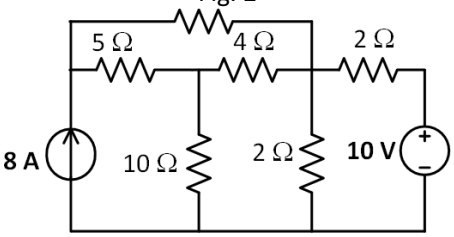

Fig. 4

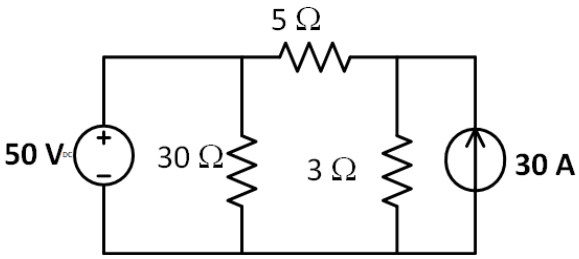

Fig. 5

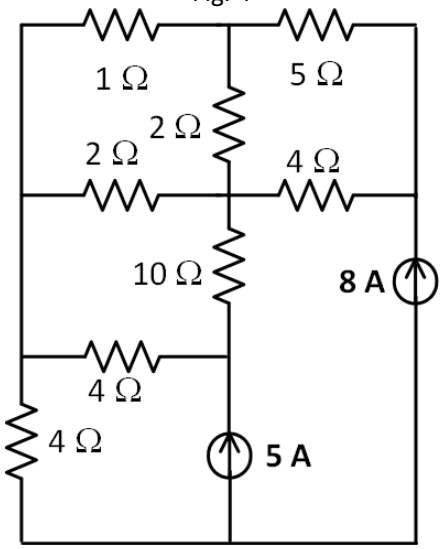

Fig. 6

2. Consider the circuits shown in fig. 7 through fig. 12. Using Nodal analysis, solve for currents and voltages across all the resistances in a given circuit.

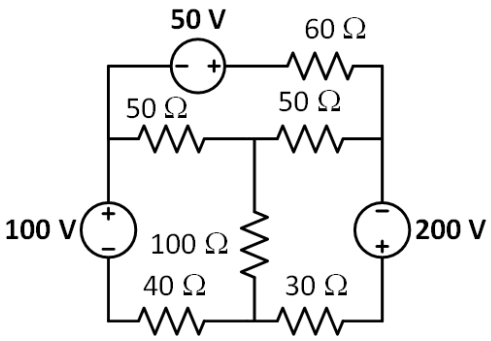

Fig. 7

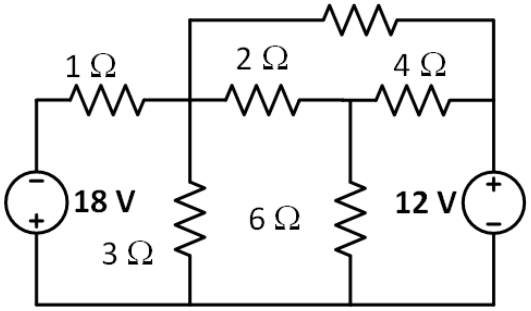

Fig. 8

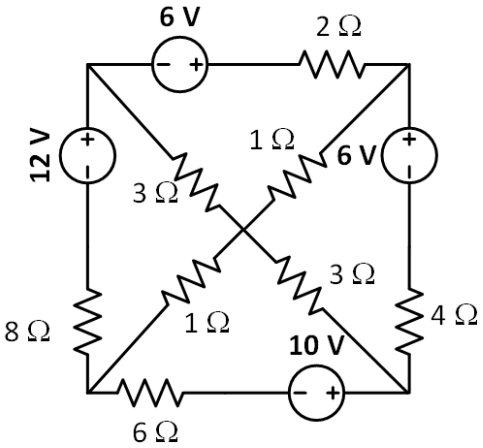

Fig. 9

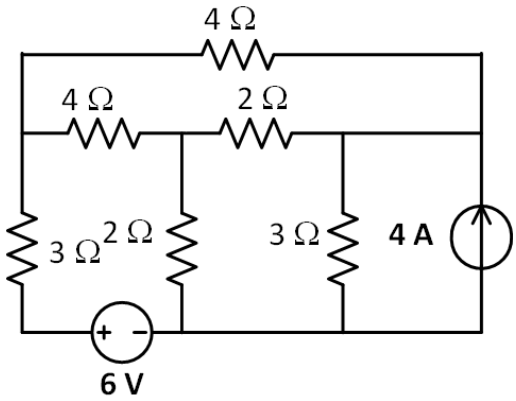

Fig. 10

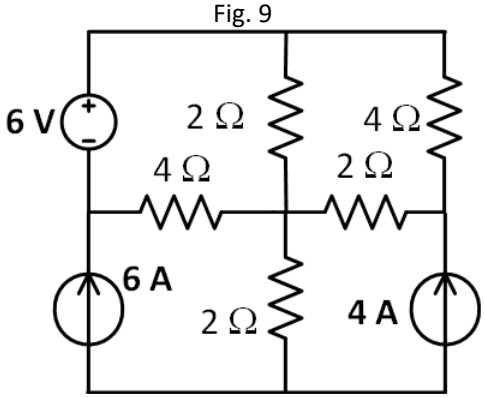

Fig. 11

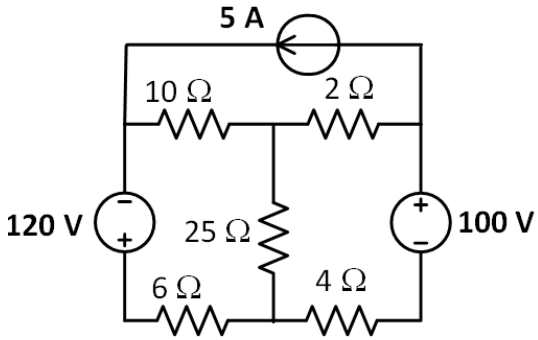

Fig. 12

---------- END OF QUESTIONS ----------

Answers:

1. Fig. 1: $V_1 = 0.8085$ V, $V_2 = 0.8936$ V; $I_{0.2\Omega} = -0.4255$ A; $I_{0.33\Omega} = 2.4255$ A, $I_{0.25\Omega} = -3.5744$ A
   Fig. 2: $V_1 = 16.8571$ V, $V_2 = 28.2857$ V, $V_3 = 14$ V, $V_4 = 10$ V; $I_{2\Omega} = 3.43$ A, $I_{2\Omega} = 0.57$ A, $I_{4\Omega} = 4.57$ A, $I_{2\Omega} = 1.43$ A, $I_{2\Omega} = 2$ A, $I_{1\Omega} = 10$ A

Fig. 3: V_1 = 190 V, V_2 = 109 V, V_3 = 23 V; $I_{5\Omega}$ = 16.2 A, $I_{50\Omega}$ = 3.8 A, $I_{8\Omega}$ = 10.75 A, $I_{20\Omega}$ = 5.45 A, $I_{4\Omega}$ = 5.75 A

Fig. 4: V_1 = 34.43 V, V_2 = 11.24 V, V_3 = 17.63 V; $I_{5\Omega}$ = 3.36 A, $I_{10\Omega}$ = 1.763 A, $I_{4\Omega}$ = 1.5975 A, $I_{5\Omega}$ = 4.838 A, $I_{2\Omega}$ = 5.62 A

Fig. 5: V_1 = 50 V, V_2 = 75 V; $I_{5\Omega}$ = 5 A, $I_{30\Omega}$ = 1.67 A, $I_{3\Omega}$ = 25 A, I_{source} = 3.33 A

Fig. 6: V_1 = 52 V, V_2 = 57.09 V, V_3 = 59.6 V, V_4 = 68.46 V, V_5 = 76.26 V; $I_{1\Omega}$ = -5.09 A, $I_{2\Omega}$ = -3.8 A, $I_{4\Omega}$ = -4.115 A, $I_{4\Omega}$ = 13 A, $I_{5\Omega}$ = -3.834 A, $I_{4\Omega}$ = -4.165 A

2. **Fig. 7:** I_1 = 2.873 A, I_2 = 3.333 A, I_3 = 2.252 A

	40 Ω	100 Ω	60 Ω	50 Ω	50 Ω	30 Ω
I (A)	2.873	-0.46	2.252	-1.081	-0.621	3.333
V (V)	114.92	-46	135.12	-54.05	-31.05	100

Fig. 8: I_1 = -9.182 A, I_2 = -6.243 A, I_3 = -5.987 A, I_4 = -2.602 A

	1 Ω	3 Ω	6 Ω	8 Ω	2 Ω	4 Ω
I (A)	-9.182	-2.939	-0.256	-2.602	3.641	3.385
V (V)	-9.182	-8.817	-1.536	-20.816	9.884	13.54

Fig. 9: I_1 = -1.1754 A, I_2 = 1.2687 A, I_3 = 1.4664 A, I_4 = -1.0075 A

	6 Ω	8 Ω	2 Ω	4 Ω	1 Ω	1 Ω	3 Ω	3 Ω
I (A)	-1.1754	1.2687	1.4664	-1.0075	-2.4441	.4739	-0.1977	-0.1679
V (V)	-7.0524	10.1496	2.9328	-4.03	-2.4441	2.4739	-0.5931	-0.5037

Fig. 10: I_1 = -1.7561 A, I_2 = 0.1469 A, I_3 = -0.2927 A

	3 Ω	2 Ω	2 Ω	3 Ω	4 Ω	4 Ω
I (A)	-1.7561	-1.9023	-1.4634	.1463	0.139	-0.2927
V (V)	-5.2683	-3.8046	-2.9268	0.4369	1.756	-1.1708

Fig. 11: I_1 = 5.09 A, I_2 = 0.273 A, I_3 = -4 A, I_4 = 6 A

	2 Ω	4 Ω	4 Ω	2 Ω	2 Ω
I (A)	5.09	-0.91	0.273	4.273	10
V (V)	10.18	-3.64	1.092	8.546	20

Fig. 12: I_1 = -4.675 A, I_2 = -0.867 A, I_3 = -5 A

	10 Ω	2 Ω	4 Ω	25 Ω	6 Ω
I (A)	-0.325	-4.133	-0.867	-3.808	-4.675
V (V)	-3.25	-8.266	-3.468	-95.2	-28.05