EECS / CSE 70A MIDTERM #1

GRADING RUBRIC

Problem 1.

a.

Step	Points
Recognizing parallel combination 4Ω || 4Ω	1
Recognizing parallel combination 2Ω || 2Ω	1
Application of the parallel resistors formula (in either step 4 or step 5)	1
4Ω || 4Ω = 2Ω	1
2Ω || 2Ω = 1Ω	1
Recognizing series combination 2Ω + 1Ω = 3Ω	1
Recognizing series combination 4Ω + 2Ω = 6Ω	1
Recognizing parallel combination 2Ω || 3Ω || 6Ω	1
Application of the parallel resistors formula with 3 resistors OR Calculating parallel combinations with 2 resistors at a time, twice	1
Final answer = 1Ω	1
Total	**10**

b.

Step	Points
Recognizing parallel combinations 3Ω || 3Ω || 3Ω	3
Application of the parallel resistors formula in step 3	1
3Ω || 3Ω || 3Ω = 1Ω	1
(2Ω + 2Ω) || 0Ω = 0Ω, OR recognizing (2Ω + 2Ω) being shorted, = 0Ω	2
Recognizing series combinations 1Ω + 3Ω + 1Ω	2
Final answer = 5Ω	1
Total	**10**

Problem 2.

Step	**Points**
KCL equation at Node 1 in terms of node voltages	2
KCL equation at Node 2 in terms of node voltages	2
Recognizing that Node 3 voltage is set by the voltage source	2
Writing the expressions for currents i_1 through i_4	2
Using units in first and last steps (intermediate calculations may be left without units)	1
Carrying out the calculation steps correctly and clearly	2
Final Answers (Should be filled in the table)	
$V_1 = -1V$	2
$V_2 = 2V$	2
$V_3 = 6V$	2
$i_1 = 1A$	2
$i_2 = -4A$	2
$i_3 = -1A$	2
$i_4 = -1A$	2
Total	**25**

Problem 3.

Step	**Points**
KVL Loop equation for Mesh B	4
KVL Loop equation for Supermesh (A & C, OR, A & B & C)	5
$i_2 = I_A - I_B$ (accepted if inserted in step 1 or 2)	2
$i_3 = I_C - I_B$ (accepted if inserted in step 1 or 2)	2
$I_C + 1 = I_A$	2
Solving equations using Cramer's rule, elimination, and/or substitution	5
Final Answers	
$I_A = i_1 = 5/9$ A	1
$I_B = 1/9$ A, $I_C = -4/9$ A	1
$i_2 = 4/9$ A, $i_3 = -5/9$ A	1
$v_1 = 4\Omega\ (-I_C) = 16/9$ V	1
$v_2 = 2i_2 + 1\Omega\ (I_C) = 4/9$ V	1
Total	**25**

Problem 4.

Step	**Points**
Mesh count = 20	5
Node count = 30	5
Remarks: Not counting the reference node/ground received full score Any systematic approach received credit	-
Total	**10**

Problem 5.

Step	**Points**
Solving the open circuit voltage for Thevenin voltage source	Any two on the left 5 5
Solving the short circuit current for Norton current source	
Solving for $R_{eq} = R_{Th} = R_{No}$ by killing all independent sources	
Remark for the steps above: For attempting with correct approach 2pts, calculation steps 3pts	-
Finding any of V_{th}, I_{No}, R_{Th} using $V_{th} = I_{No} \times R_{Th}$	2
Drawing the correct Thevenin equivalent network	2
Annotating the correct source voltage and resistance in Thevenin circuit	2
Drawing the correct Norton equivalent network	2
Annotating the correct source current and resistance in Norton circuit	2
Total	**20**