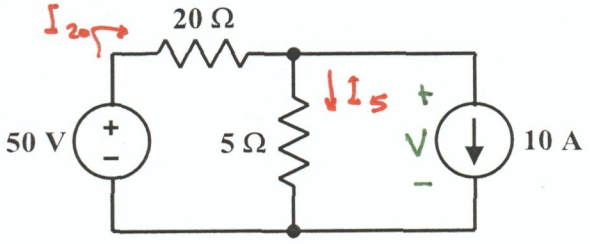
EE 2240

Problem #08

Given the circuit shown below:



a. How much power does the 5Ω resistor absorb?

$I_{20} = I_5 + 10A$

KVL: $(20\Omega)I_{20} + (5\Omega)I_5 = 50V \Rightarrow (20\Omega)(I_5 + 10A) + (5\Omega)I_5 = 50V$

$25I_5 + 200 = 50 \Rightarrow 25I_5 = -150 \Rightarrow I_5 = -6A$

b. How much power does the 20Ω resistor absorb?

$P_{5\Omega} = I_5^2(5\Omega) = (-6A)^2(5\Omega)$

$= 180W$

$P_{20\Omega} = I_{20}^2(20\Omega)$

$= (I_5 + 10A)^2(20\Omega) = (-6A + 10A)^2(20\Omega)$

$= (4A)^2(20\Omega) = 320W$

c. Does the independent current source deliver power or absorb power? How much?

$V = (5\Omega)I_5 = (5\Omega)(-6A) = -30V$

∴ The independent current source delivers $(10A)(30V) = 300W$

d. Does the independent voltage source deliver power or absorb power? How much?

Since $I_{20} = I_5 + 10A = 4A$,

the independent voltage source delivers $(50V)I_{20} = (50V)(4A) = 200W$