Checkpoints Chapter 8
ELECTRONICS BASICS

Question 302

All they actually want you to do is to read the scale and work out what the value of the line is. 1.2 Volt is a good approximation.

Question 303

This is because it is an AC signal that has been translated up a constant amount. The translation is due to the DC.

∴ C (ANS)

Question 304

This is the simplest case of a voltage divider, the two resistors are the same, so the voltage is split equally across both.

So V_{out} = 12 V (ANS)

Question 305

The resistors in parallel effectively half the resistance in that part of the circuit. So the resistance across the output is half the resistance in the other section of the circuit. This means that the potential drop across the output will be half the potential drop across the other resistor. With a total of 24 V around the circuit. 16V will be lost across the top resistor and 8 Volt will be lost across the resistors in parallel.

So V_{out} = 8 V (ANS)

Question 306

The voltage across the single resistor will be 16 Volt. (See previous question)

So V_{out} = 16 V (ANS)

Question 307

The resistors are now all in series, so there will be a potential drop of 8 Volt across each resistor. This means the potential drop across the output will be 16 Volt.

So V_{out} = 16 V (ANS)

Question 308

With a 'short circuit' as one option for the current and a resistor in the other path, all the current will flow through the short circuit. This means that there will not be a potential difference across the output resistor

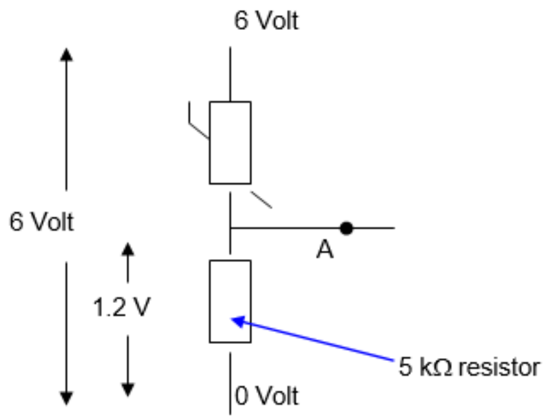
∴ V_{out} = 0 (ANS)

Question 309

With a 'short circuit' as one option for the current and a resistor in the other path, all the current will flow through the short circuit. This means that there will not be a potential difference across the upper resistor. ∴All the potential will drop across the output.

∴ V_{out} = 24 V (ANS)

Question 310



This circuit needs to lose 4.8 Volt across the thermistor.
This is 4 times the potential drop of the 5 kΩ resistor, so the resistance of the thermistor

= 4 × 5 kΩ

R = 20 kΩ (ANS)

Question 311

The voltage drop across L_2 must be

12.0 – 3.0 = 9V.

As the voltage drop is 3 times larger, the resistance must also be three times larger, because the current in both is the same.

∴ 45 Ω (ANS)

Question 312 (2010 Q1, 2m, 70%)

The diode has a maximum voltage drop across it of 1 V. This means that the voltage drop across the 500Ω resistor will be 6V – 1V = 5V. Using v = iR gives 5 = i × 500

∴ i = 10 mA. (ANS)

This will be the current in the ammeter, because it is in series with both the diode and the resistor. You need to double check that this current fits on the I V curve for the diode.

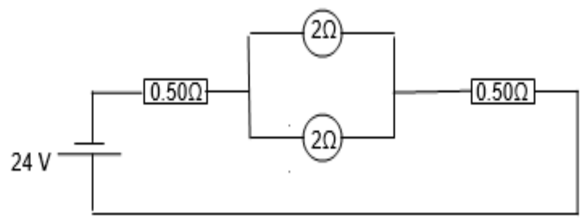
Question 313 (2010 Q2, 2m, 35%)

The 200Ω resistor and the diode are in parallel. This means that the voltage drop across both these elements will be the same. The voltage drop across the diode is limited to 1V. This means that the voltage drop across the 500Ω resistor will be 5.0 V.

∴ **current remains 10 mA (ANS)**

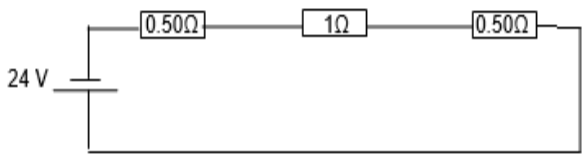
Question 314 (2010 Q3, 2m, 60%)

It is often best to try to redraw the diagram so that the elements in series and parallel are more obvious.



The effective resistance of two 2 Ω resistors in parallel is 1 Ω. ($\frac{1}{R_{total}} = \frac{1}{2} + \frac{1}{2}$)

This will lead to the circuit looking like this.



This means the potential drops around the circuit will be 6 V across each resistor and **12 V across both globes**.

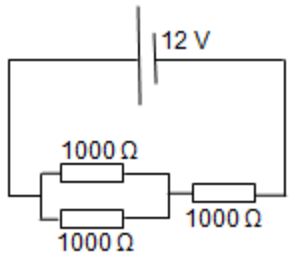
Question 315 (2010 Q4, 2m, 60%)

The total resistance of the circuit is 0.5 + 1 + 0.5 = 2Ω. Using V = iR, gives i = 24/2.

∴ **12 A (ANS)**

Question 316 (2010 Q11, 3m, 77%)

The voltage drop across the two resistors in parallel will be half the voltage drop across the single resistor. This means that the drop across the parallel elements will be 4 V and across the single element it will be 8 V.



Question 317 (2011 Q1, 2m, 65%)

The circuit can be redrawn as

The resistance of the parallel components is given by

$\frac{1}{R_{Parallel}} = \frac{1}{2} + \frac{1}{4}$

∴ $R_{parallel} = \frac{4}{3}$

∴ $R_{TOTAL} = 2 + 1.33$

= 3.33 Ω (ANS)

Question 318 (2011 Q2, 2m, 50%)

Since the total resistance is 3.3 Ω, the current in the circuit is $\frac{10}{3.3} = 3$ A.

Therefore the current in B will be 2 A and the current in both C and D will be 1 amp.

∴ **2 A (ANS)**

Question 319 (2011 Q3, 2m, 65%)

Use V = iR where I = 3 A and R = 2 Ω

∴ **V = 6 V (ANS)**

Question 320 (2011 Q4, 2m, 30%)

Since the voltage drop across A is 6 V, the voltage across C + D, must be 4 V combined.

∴ $V_D = 2V$

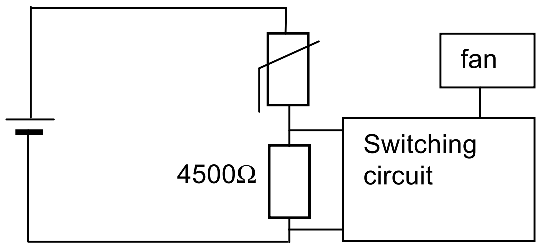
Use P = VI, where V = 2V and I = 1 A

∴ **P = 2W (ANS)**

Question 321 (2011 Q5, 1m, 97%)

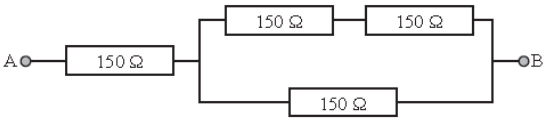
From the graph **1500 Ω (ANS)**

Question 322 (2011 Q6, 3m, 50%)

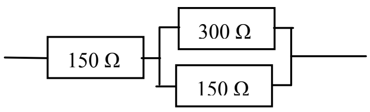


Question 323 (2012 Q1, 2m, 85%)

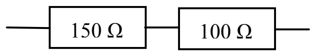
The circuit



can be redrawn as (from adding the two resistors in series)



which can be redrawn as.



because

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_T} = \frac{1}{300} + \frac{1}{150}$$

$$\frac{1}{R_T} = \frac{1}{300} + \frac{2}{300}$$

$\therefore R_T = 100\ \Omega$

Therefore the effective resistance is **250 Ω (ANS)**

Question 324 (2013 Q9, 3m, 73%)

The output across XY will vary according to the voltage drop across the variable resistor. The greater the voltage drop across the variable resistor the smaller the output voltage.

The smallest voltage drop across the **variable** resistor is when its resistance is zero.

$\therefore V_{OUT} = 15 - 0$

$= 15$ V

The largest voltage drop across the **variable** resistor is when its resistance is 10 kΩ.

When the variable resistor is 10 kΩ the voltage drop across it will be 10 V. This is because it will be twice the size of the voltage drop across a 5 kΩ resistor.

$\therefore V_{OUT} = 15 - 10$

$= 5$ V

∴ 5 – 15 V Output (ANS)

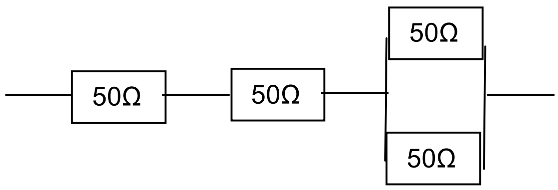
Question 325 (2013 Q10, 2m, 85%)

125 = 50 + 50 + 25

We get the 25 from $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$

$$\therefore \frac{1}{R_T} = \frac{1}{50} + \frac{1}{50}$$

$\therefore R_T = 25$



Question 326 (2014 Q6a, 1m, 93%)

If the switch is open, then the voltmeter is not in a completed circuit.

∴ 0 V. (ANS)

Question 327 (2014 Q6b, 2m, 75%)

When the switch is closed the voltmeter will function.

The 900 Ω and 300Ω resistors are in series. Therefore one quarter of the potential will be lost across the 300 Ω resistor.

∴ 2.0 V (ANS)
