DUBLIN CITY UNIVERSITY

Autumn 2001

COURSE:	APPLIED PHYSICS PHYSICS with a LANGUAGE
YEAR:	2
SEMESTER	1
EXAMINATION:	Electronics 1; PS203
EXAMINER:	Dr B. Lawless
DURATION:	2 hours
INSTRUCTIONS:	Answer 4 parts of Question 1 (50 %) and 2 other questions (25 % each)

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until instructed to do so.

Question 1. Answer four parts of this question.

(a) Calculate the Thévenin equivalent of the circuit in Figure 1.

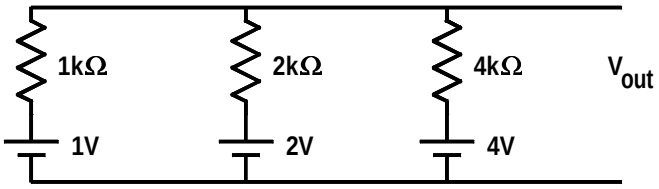

Figure 1: Question 1 (a)

(b) Calculate the voltage difference between nodes A and B in the circuit of Figure 2.

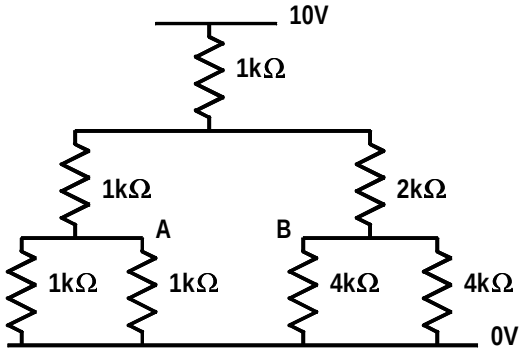

Figure 2: Question 1 (b)

(c) The three filter circuits A, B and C having the responses shown in Figure 3 are connected in series. Sketch the frequency response of the composite circuit for a frequency range from 10Hz to 1000kHz.

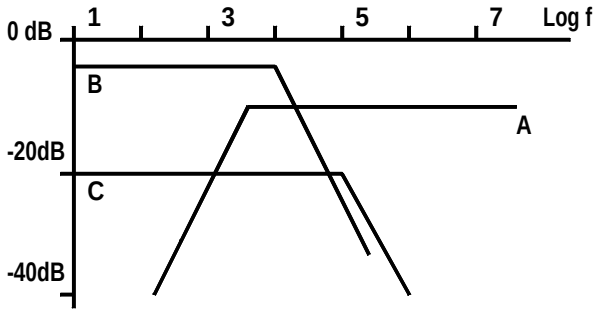

Figure 3: Question 1 (c)

(d) Calculate the voltages at the nodes A, B, C, D and E in the circuit shown in Figure 4. All the diodes are silicon.

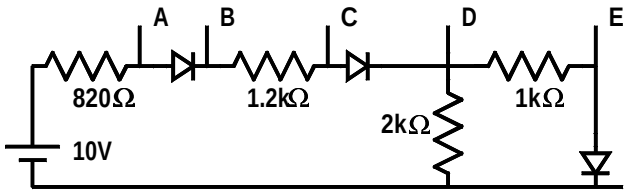

Figure 4: Question 1 (d)

(e) The collector voltage in the circuit in Figure 5 is measured to be 6.3 V. Calculate the current gain of the transistor.

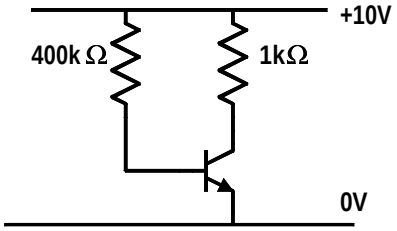

Figure 5: Question 1 (e)

(f) What is the resonant frequency of the circuit in Figure 6? Sketch the response of the filter as a function of frequency.

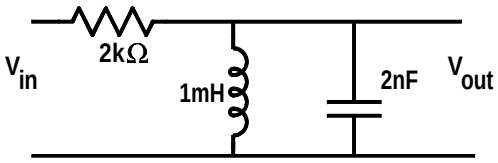

Figure 6: Question 1 (f)

(g) What current flows in a 0.1 μF capacitor when a 6 V amplitude sinusoidal signal at a frequncy of 400 Hz is applied across the capacitor?

Question 2. Calculate the emitter, base and collector voltages for the circuit shown in Figure 7. Calculate the small signal voltage gain of the amplifier. Sketch the waveforms which you would observe with an oscilloscope connected to the emitter, the base and the collector of the circuit when the input voltage is a 3 mV sinusoidal signal at 2 kHz.

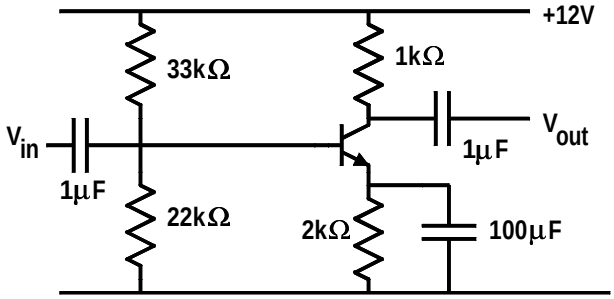

Figure 7: Question 2

Question 3. Explain how you would select the component values for the FET amplifier shown in Figure 8 so that the amplifier will have a gain of -5. The JFET has a $g_m = 2000\mu$S, $I_{DSS} = 7$ mA and a $V_{GS(off)} = 2$ V.

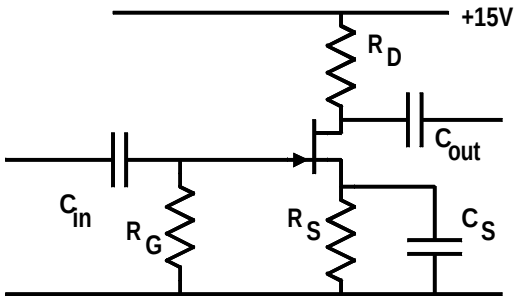

Figure 8: Question 3

Question 4. Obtain the equation which relates the output voltage to the input voltages V_1 and V_2 for the circuit shown in Figure 9.

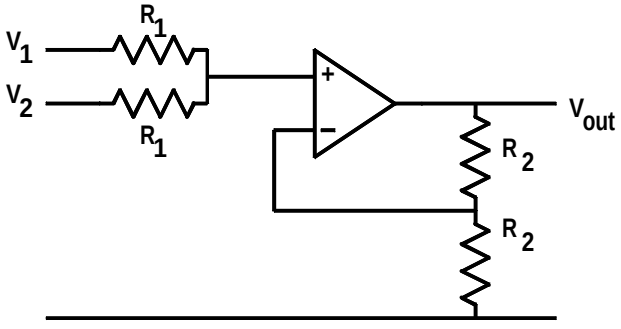

Figure 9: Question 4