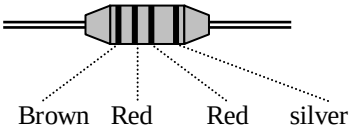
The Open University of Sri Lanka- Department of Physics
B.Sc. Degree Programme (Level 3) –2009/2010
Electronics for Biology students (PCU1170)

Assignment

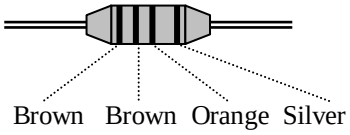
Answers should be submitted on or before **02nd of October** 2009

(1). (a) Find the possible minimum and maximum values of the following resistors

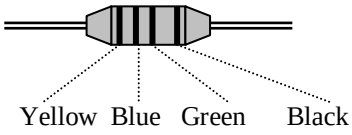
(i)



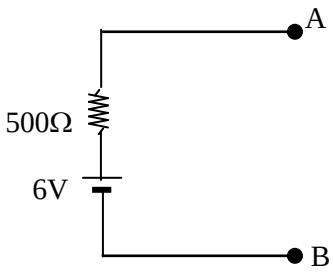
(ii)



(iii)



(b) A and B terminals of this circuit is connected by a conductor or1 kΩ resistor or 2200μF capacitor. Sketch voltage- time graph and current-time graph for each situation. indicating the values at time 0 s, 1 s and 2 s.



(2). An LED rated as 2.5 V/ 0.5 W is lighten using a 6 V dc battery.

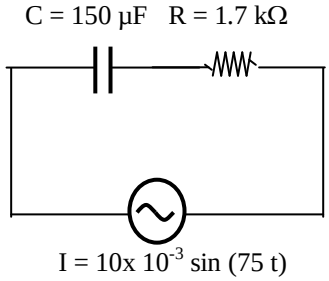
(a). Find the suitable resistor which can be used to limit the current.

(b). Calculate the energy dissipated by the LED in two minutes.

(c). How many electrons will flow through the LED in the above period?

(d). IF the battery consists of 0.5 Ω internal resistor find the power dissipated by the LED and resistor.

(3) A capacitor (C) and a resistor (R) are connected in series with a signal generator, which produces sinusoidal current (I) through the circuit, $I = I_o \sin(\omega t)$.



(a) Calculate the impedance of each component (R and C).
(b) What are the peak voltages across the resistor and the capacitor?
(c) Calculate the total impedance of the circuit.
(d) Draw the phasor diagram for voltage across each component
(e) Explain why this circuit does not have a resonance frequency.

(4)

(i). Write down three special features of operational amplifiers.
(ii) Draw a diagram of an inverting amplifier circuit using 100kΩ and 1kΩ resistors.
(iii).Calculate the voltage gain of the circuit.
(iv) Draw the output voltage pattern for the sinusoidal input voltage signal with 400mV.
(v). Explain the advantage of off set null terminals of an operational amplifier
(vi). Give an IC number of a general purpose operational amplifier. .

(a). An alternative current source can be represented by $I= I_o \cos$……., where ω is the angular frequency of the source and the frequency ;f = ……
(b). If a pure resistor with R ohms is connected with the above soruce, the voltage variation across the resistor can be given by ;V_R = …….. ,
the maximum voltage across the resistor is…….
(c). Now a capacitor with C Farad is connected with the above resistor in series.
The maximum voltage across the capacitor is V_{OC} = ……..and
the total impedance of the resistor –capacitor circuit is Z_{RC} =…….
(d). If an inductor with L Henry is connected with the resistor in series , the maximu voltage across the inductor is V_{OL} = …… And
the impedance of the resistor- inductor circuit is Z_{RL} = ……

(4). What are the ideal and real characteristics of an Op-amp. Explin why the high voltage gain of a Op-amp is a disadvantage.
(a).Derive the voltage gain of the non-inverting amplifier circuit.
(b).How do you select the input resistor (R_{in}) and feed back resistor (R_f) of a non-inverting amplifier in which the voltage gain equals to 100 ?
(c). Derive the voltage gian of a Op-amp buffer circuit.
(d).Why two buffers are used at the input of an instrumentation amplifier.

(5). Give the complete circuit diagram of a + 18V regulated power supply.
(a). At the voltage rectifier stage, why full wave rectifier is more suitable than half wave rectifier ?

(b).Compare the out put wave patterns of a full wave rectifier circuit when 10μF and 2200μF capacitors are connected and calculate the ripple valtage in each case .

(c). How do you modify the above low voltage power supply circuit to obtain the separate variable voltage which can be changed from 1.25V to 13.75V.