

- (1) An electrical load operates at 240 V rms. The load absorbs an average power of 8 kW at a lagging power factor of 0.8.
- (a) Calculate the complex power of the load. (5%)
- (b) Calculate the impedance of the load. (5%)

- (2) Current through the human body can cause injury. The common injury is to the nervous system. In Figure 1 assume that the voltage difference between one arm and one leg is 250 V, the resistance of the arm is 400 ohms, the resistance of the trunk is 50 ohms and the resistance of the leg is 300 ohms.
- (a) Draw a simplified model of the path of current through the body. (5%)
- (b) Calculate the current through the body. (5%)

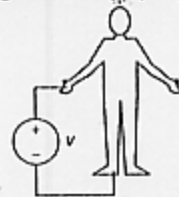


Figure 1

- (3) Figure 2 shows an arrangement of flashlight components. Draw a circuit model for a flashlight. (10%)

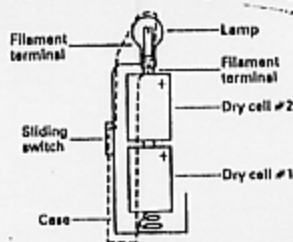


Figure 2

- (4) The uncharged capacitors in the circuit shown in Figure 3 is initially switched to terminal a of a three-position switch. At  $t = 0$  the switch is moved to position b, where it remains for 15 ms. After the 15 ms delay, the switch is moved to position c, where it remains indefinitely.
- (a) Derive the numerical expression for the voltage across the capacitor. (10%)
- (b) Plot the capacitor versus time. (10%)
- (c) When will the voltage on the capacitor equal 200 V. (5%)

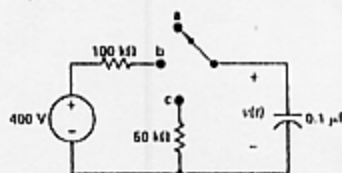


Figure 3

- (5) For the circuit shown in Figure 4,  
 (a) Find the no-load value of  $v_o$ . (5%)  
 (b) Find  $v_o$  when  $R_L$  is  $450\text{ k}\Omega$ . (5%)

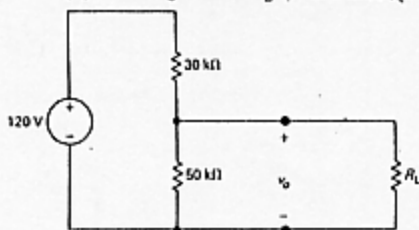


Figure 4

- (6) In the circuit shown in Figure 5, a load having an impedance of  $39 + j 26$  ohms is fed from a voltage source through a line having impedance of  $1 + j 4$  ohms. The rms value of the source is  $250\text{ V}$ .  
 (a) Calculate the load current  $I_L$  and voltage  $V_L$ . (5%)  
 (b) Calculate the average and reactive power delivered to the load. (5%)  
 (c) Calculate the average and reactive power delivered to the line. (5%)

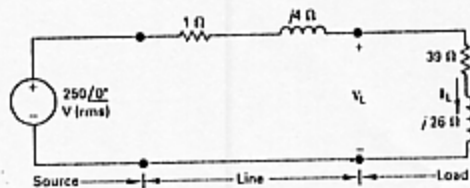


Figure 5

- (7) The voltages and currents on interconnected circuit elements obey Kirchhoff's laws. Describe the Kirchhoff's current law and Kirchhoff's voltage law. (10%)
- (8) For the circuit shown in Figure 6  
 (a) Find the value of  $R_L$  that results in the maximum power being transferred to  $R_L$ . (5%)  
 (b) Calculate the maximum power that can be delivered to  $R_L$ . (5%)

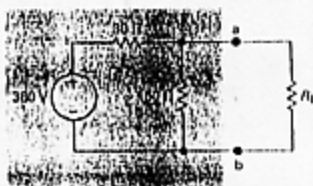


Figure 6

國立中山大學 八十九學年度碩博士班招生考試試題

科目：計算機概論 電機工程學系碩士在職專班 共 1 頁

Problem 1 : Please briefly answer the following sub-problems for numerical representations.

- (a) What is the range of 2's complement number (in decimal) of a byte can represent ?
- (b) What is the 2's complement representation of  $(-17)_{10}$  in a single byte?
- (c) If the sign-magnitude representation is adopted, please show  $(-17)_{10}$  in a byte.
- (d) If the  $(-17)_{10}$  in a byte is required to be extended to a word (2 bytes) for a possible word calculation, please show it in a word format.
- (e) What is a nibble?

(Please show your derivation. No credit for any lucky guess, 20 pts, 4 pts for each sub-problem)

Problem 2 : Please briefly answer the following sub-problems for digital logics.

- (a) You are given many 1-out-of-16 decoder standard ICs. However, you can not perceive its internal circuit. Hence, it can be treated as a block. You are then asked to design a 1-out-of-256 decoder. Thus, how to arrange those standard decoders to achieve the goal? Please show your design as detailed as possible. (The address lines are  $A_0, A_1, \dots$ )
- (b) Many arithmetic units can be realized by MUXs (multiplexer) which are easily to find in the standard cell library. Please use 2 4-to-1 MUX to implement a full adder.

(20 pts, 10 pts for each sub-problem)

Problem 3 : Please briefly answer the following sub-problem for execution speed.

- (a) Assume the number of data to be sorted is very large. Please compare the execution speed of the following 4 sorting methods : heap sort, insert sort, quick sort, and merge sort.
- (b) Assume a uniform hash function is used for a hash table with a fixed loading density, 0.50. Please compare the searching speed of the following three overflow handling schemes for an entry existing in the hash table : linear probing, rehashing, and chaining.

(Please show your derivation. No credit for any lucky guess, 20 pts, 10 pts for each sub-problem)

Problem 4 : Please briefly answer the following sub-problem for speed comparison.

- (a) Please order the delay for CPU to access data from the following memory devices : RAM, ROM, registers, hard disk drive, cache.
- (b) Please order the delay for you to transfer a big file over the following networks : giga-bit ethernet, ethernet, fast ethernet.

(20 pts, 10 pts for each sub-problem)

Problem 5 : Please briefly answer the following networking terminology terms.

- (a) ADSL
- (b) ATM
- (c) FDDI
- (d) MAC
- (e) T3

(20 pts, 4 pts for each sub-problem)