交通大學 平面顯示技術學程 碩士在職專班入學考試 (2007 年)

請從以下題目選擇五題作答，每題二十分。作答超過五題者，以最低分五題計算。

1. **(a) How do the emitting colors of semi-conducting materials change by p-doping and n-doping, and how do their HOMO (highest occupied molecular orbital in valence band) and LUMO (lowest unoccupied molecular orbital in conduction band) energy levels change by p-doping and n-doping.**
   (b) Explain why the thin films of semi-conducting materials become more transparent as the conductivity is reduced.
   (c) Compare the differences of chemical structural requirements and process conditions in semi-conducting organic (hydrocarbon-related) materials and semi-conducting inorganic (Si-related) materials.

2. **(a) What are the definitions of refractive index and dielectric constant.**
   (b) Explain the principle to measure the refractive index and dielectric constant, and the parameters to influence these values in liquid crystals.
   (c) Explain why liquid crystals can be used in displays regarding their refractive and dielectric properties.

3. **Describe the techniques to determine if a thin film transistor is amorphous Si or polycrystalline Si type, and show the reasons why they can do it.**

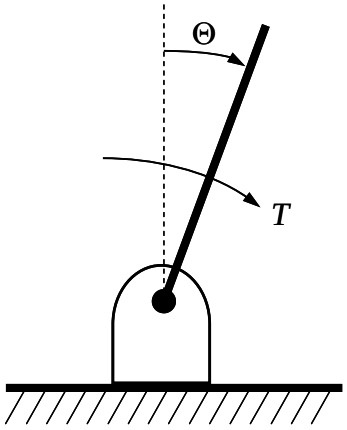
4. **To characterize a transparent conducting electrode of indium tin oxide for flat panel displays, list a number of possible ways for the measurement of surface roughness and chemical compositions with the related basic principles.**

5. （製程檢測技術）LCD 彩色濾光片的製程為主要是先在玻璃基板上濺鍍一層金屬鉻或金屬鉻與氧化鉻的複合鍍層，再以光阻微影蝕刻的製程製作出格子狀的黑色矩陣(Black Matrix)。其後依次以紅、綠、藍光阻將彩色濾光層製作在基板上，接著全面塗佈一層平坦層，再濺鍍一層透明導電電極於其上。再以光阻製作間隙物(photo spacer)於所完成的彩色濾光片上，用來控制 LC Cell 的間距。在各製程中需針對表面形狀、異物、膜厚、色度、光學密度等參數作製程監控。針對彩色濾光片製程量測參數，請說明下列量測參數的定義: (a) 黑色矩陣(Black Matrix)之光學密度; (b) RGB 之色度; (c) Photo Spacer 之膜厚.

6. **（設備伺服控制技術）An inverted pendulum shown in the following Figure has the transfer function**

$$G_p(s) = \frac{\Theta(s)}{T(s)} = \frac{2}{s^2 - 2}$$

Where Θ(*s*) represents the angle of the rod and *T*(*s*) represents the torque applied by a motor at the base.



(a) Sketch the root locus for a proportional controller, $G_c(s) = K_p$. What type of closed-loop response would you expect for different values of K_p ?

(b) Design a *lead controller* of the form

$$G_c(s) = K_L \frac{s - z_c}{s - p_c}$$

Choose Z_c = -3, and solve for P_c from the angle criterion so that the dominant closed-loop poles are at -3 ± 3j.

Draw the resulting root locus for this system, and calculate the gain K_L that results in the desired closed-loop poles

7. **To create the voltages of 1.3 V, 2.8 V, and 3.6 V using a DC voltage source of 5 V and 5 resistors.**

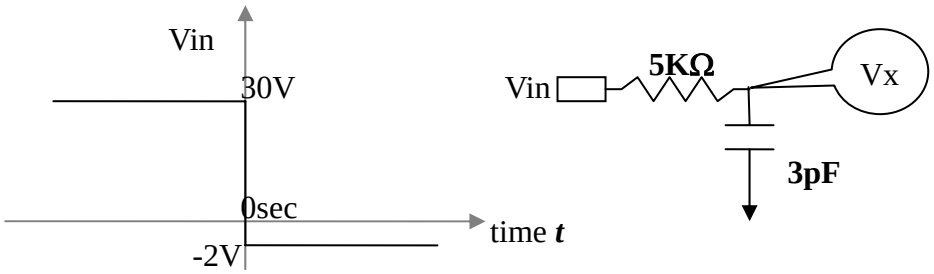
(a) Draw the circuit of your design.

(b) What is the power consumption of your design?

8. For the input voltage Vin and the RC circuit shown below, Vin changes from 30 V to -2 V at the moment when time *t* = 0 sec.

(a) Draw the waveform of Vx.

(b) Describe how to calculate the moment when Vx = 5 V.



9. (a) Please write the 4-terms of differential and integral form of Maxwell's equation (with time-varying).

(b) Explain the physical meaning of each term of the Maxwell's equation.

Differential Form	Integral Form	Physical meaning
$\nabla \times \boldsymbol{E} =$	$\oint_c \boldsymbol{E} \cdot d\lambda =$	
$\nabla \times \boldsymbol{H} =$	$\oint_c \boldsymbol{H} \cdot d\lambda =$	
$\nabla \cdot \boldsymbol{D} =$	$\oint_s \boldsymbol{D} \cdot \boldsymbol{ds} =$	
$\nabla \cdot \boldsymbol{B} =$	$\oint_c \boldsymbol{B} \cdot \boldsymbol{ds} =$	

10. Please explain what is "Electrostatic shielding(靜電屏蔽效應)", and give an application example of the effect.