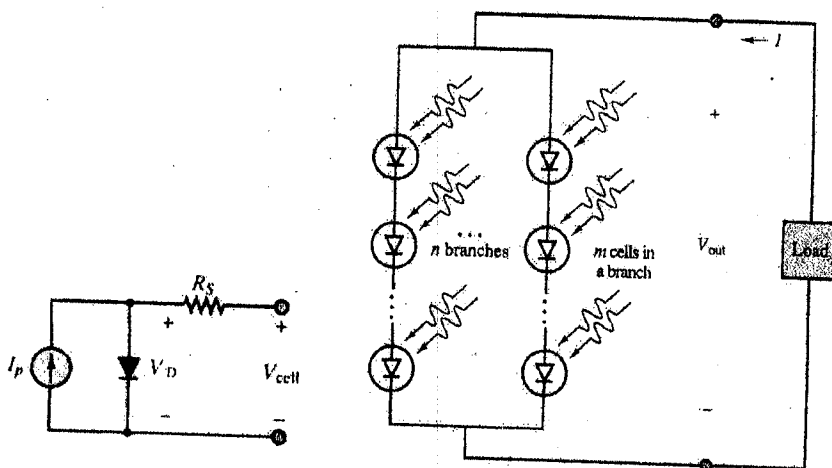所別：光電科學研究所碩士班　不分組 科目：電子學

1. Draw the circuit symbol and label the nodes' name : (a) Zener diode , (b)pnp BJT, (c)enhancement n-channel MOSFET, (d)depletion p-channel MOSFET, (e) p-channel JFET. (4*5=20)

2. I_p is the strength of the current generated by the incident light on the solar cell. We can express the current i_D and voltage V_D relationship of the solar cell using the diode equation and circuit model shown in fig2-1:
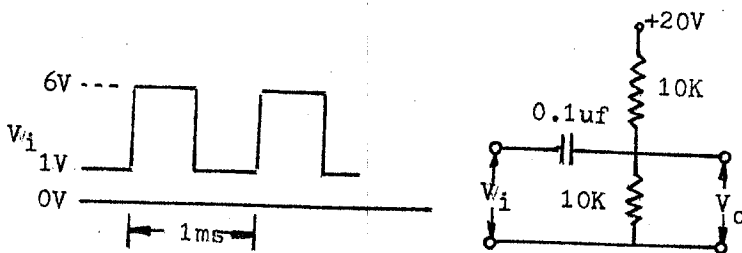
$$i_D = I_o[\exp(qV_D / kT) - 1] - I_p$$

$I_p=20$ mA, $I_o=50$ pA, $R_s=0.7\,\Omega$, $k=1.38*10^{-23}$, $T=300$, $q=1.6*10^{-19}$. To increase the power output to a level sufficient for practical applications, solar cells can be connected in series and in parallel (solar arrays shown in fig2-2). Design the minimum array size(m and n)achieve the output $V_{out} = 10V$, $I = -0.5A$? (20)

3. The following logic function $Z=(A*B)+C\oplus A$. (a) if A=true, B=false, C=true, what's Z? (b) draw the logic gate circuit. (c) realize the function using CMOS device.   (5,5,10)

4. The square wave shown is fed to an RC coupling input. Calculate the output voltage V_o ?
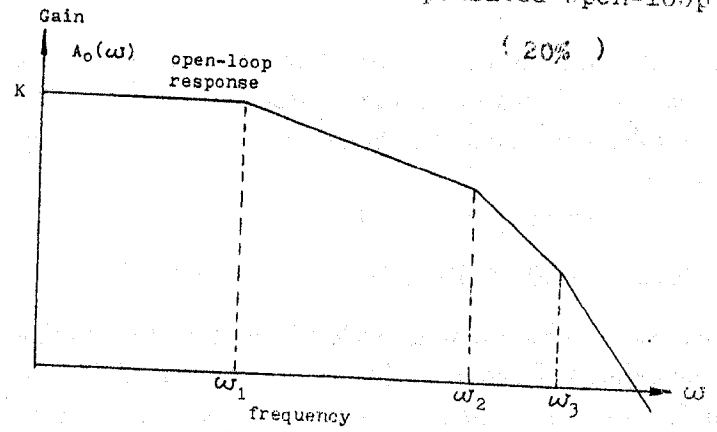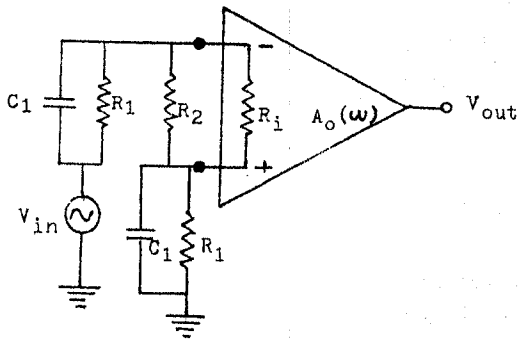
(20%)

注意：背面有試題

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5. The open-loop response of a OP-AMP is modified by $R_1 C_1$ network to provide the required frequency characteristics. If $R_1 C_1 = \dfrac{1}{\omega_1}$. Plot and calculate the compensated open-loop gain $A'_0(\omega)$.

(20%)