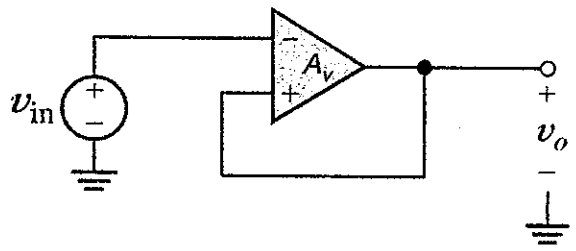
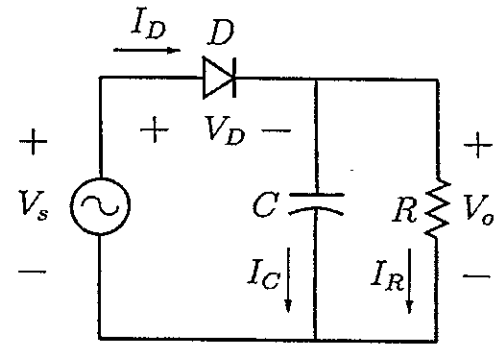
1. (10%) How is a P-N junction formed? What is the built-in potential for a P-N junction diode?
2. (10%) What is a cascade amplifier? What is the main purpose of using a cascading amplifier? What are the advantages and disadvantages?
3. (15%) Please answer the following questions related to Impedance matching for amplification.
   (1) Fill in the following table ((a) to (h)) for **IDEAL** amplifiers.

Amplifier type	Input impedance	Output impedance	Gain parameters
Voltage	(a)	(b)	A_{voc}
Current	(c)	(d)	A_{isc}
Transconductance	(e)	(f)	G_{msc}
Transresistance	(g)	(h)	R_{moc}

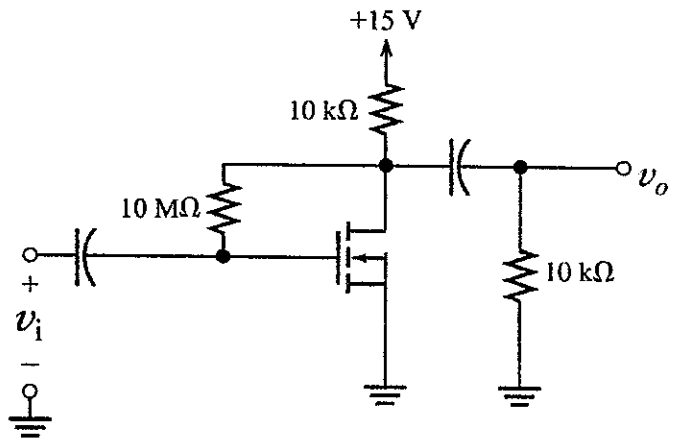
   (2) Draw a circuit of a voltage follower using an OP. Using one of the four amplifiers in (1), describe how the voltage follower works.
4. (15%) The unity-gain buffer shown on the right is designed to drive a 100 Ω load with an acceptable gain error of 0.5%. Determine the required OP-Amp open-loop gain A_v if the OP-Amp has an output impedance of 1 kΩ.



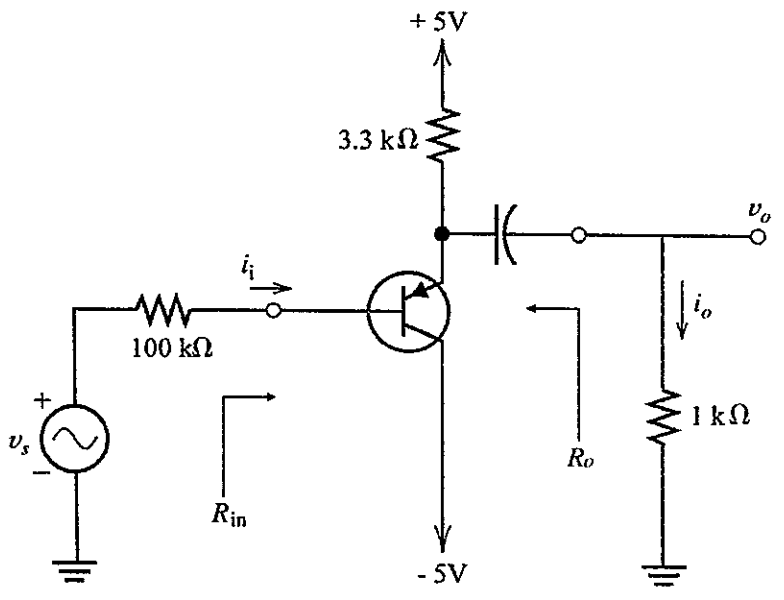
5. (15%) In the half-wave rectifier circuit shown on the right, the source voltage has an amplitude $V_m = 15$ V and frequency $f = 50$ Hz. Consider the diode to be ideal. With $R = 500\ \Omega$, what is the minimum value of C if the output ripple is to be limited to $V_R = 1$ V? What is the peak diode current i_D^{max} in that case?



6. (15%) The figure shows a discrete enhancement MOSFET amplifier in which the input signal v_i is coupled to the gate via a large capacitor, and the output signal at the drain is coupled to the load resistance R_L via another large capacitor. Please determine the voltage gain and input resistance of this circuit. The transistor has $V_t = 1.5$ V, $k_n'(W/L) = 0.25$ mA/V^2, and $V_A = 50$ V. Assume the coupling capacitors to be sufficiently large so as to act as short circuits at the signal frequencies of interest.



7. (20%) In the emitter follower on the right, the signal source is directly coupled to the transistor base. If the dc component of v_S is zero, find the dc emitter current. Assume $\beta = 120$. Neglecting r_o, find R_i, the voltage gain v_o/v_s, the current gain i_o/i_s and the output resistance R_o.



試題隨卷繳回