

國立臺北大學 104 學年度學士班暨進修學士班轉學生招生考試試題

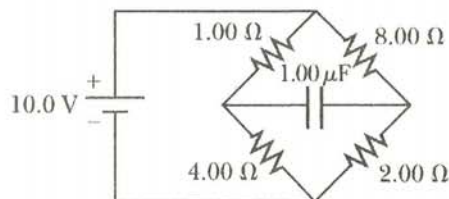
系 別：電機工程學系學士班 2 年級
 科 目：普通物理

考試時間：80 分鐘

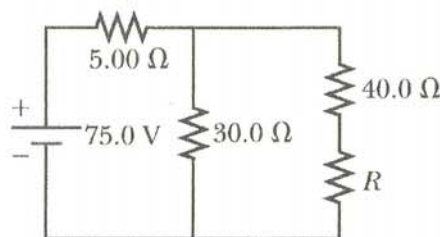
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可 不可 使用計算機

- Please describe the differences of energy-band gap patterns among ① insulators, ② semiconductor, and ③ metals. (5%)
- Find the electric field (E) due to an infinite plane of positive charge with uniform surface charge density (ρ) in free space. (5%) [Note: the permittivity of free space is ϵ_0]
- Please explain the Einstein's Photoelectric effect. (5%)
- What's the Heisenberg's Uncertainty Principle? (5%)
- What is the de Broglie wavelength of an electron with a kinetic energy of 200 eV. (10%) [Note: use the symbol of h for Planck constant, m for rest mass of electron, e for electron charge]
- Please write down the Maxwell's (four) equations in integral form. (10%)
- The circuit in figure below has been connected for a long time. (10%)
 - What is the potential difference across the capacitor?
 - If the battery is disconnected from the circuit, over what time interval does the capacitor discharge to one-tenth its initial voltage?



- A solenoid has length $L=1\text{m}$ and inner diameter $d=3\text{m}$, and it carries a current $i=5\text{A}$. It consists of 4 close-packed layers, each with 250 turns along length L . What is B at its center? (10%) [Note: $\mu_0=4\pi\times 10^{-7}\text{ T}\cdot\text{m/A}$]
- The resistor R in Figure below receives 20.0 W of power. Determine the value of R . (10%)



- An electric heater is constructed by applying a potential difference of 120 V across a Nichrome wire that has a total resistance of $12\ \Omega$. Find ① the current carried by the wire ② the power rating of the heater. (10%)
- An LED is constructed from a p - n junction based on a certain compound semiconductor whose energy gap is 2.0eV. What is the wavelength of the emitted light? (10%) [Note: electron charge, $e=1.6\times 10^{-19}\text{ J/eV}$. Planck constant, $h=6.6\times 10^{-34}\text{ J}\cdot\text{sec}$. Speed of light, $c=3\times 10^8\text{ m/sec}$]
- A 6.0 kg block initially at rest is pulled to the right along a frictionless, horizontal surface by a constant horizontal force of 9N. Find the block's speed after it has moved 3.0m. (10%)