

國立臺北科技大學 101 學年度碩士班招生考試

系所組別：2402 光電工程系碩士班

第三節 普通物理 試題 (選考)

第一頁 共一頁

注意事項：

1. 本試題共七題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

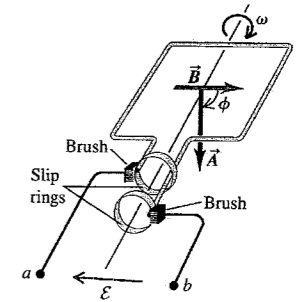
一、解釋名詞 30% (每一子題 3%)

1. particle & point charge
2. Newton's Laws of Motion
3. transverse wave & longitudinal wave
4. mechanisms of heat transfer
5. Maxwell's Equations of Electromagnetism
6. total internal reflection
7. Einstein's First & Second Postulates
8. Bohr Postulates of the Hydrogen Atom
9. spontaneous & stimulated emission
10. uncertainty principle

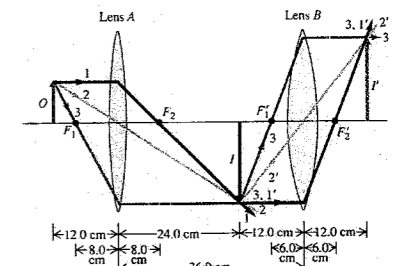
二、A block of mass M attached to a horizontal spring with force constant k is moving in SHM with amplitude A_1 . As the block passes through its equilibrium position, a lump of putty of mass m is dropped from a small height and sticks to it. Find the new amplitude and period of the motion. 10%

三、Cousin Throckmorton holds one end of the clothesline taut and wiggles it up and down sinusoidally with frequency 4.00 Hz and amplitude 0.150 m. The wave speed on the clothesline is $v = 24.0$ m/s. At $t = 0$ Throcky's end has maximum positive displacement and is instantaneously at rest. Assume that no wave bounces back from the far end. (a) Write a wave function describing the wave. (b) Write equations for the displacement, as a function of time, of Throcky's end of the clothesline and of a point 3.00 m from that end. 10%

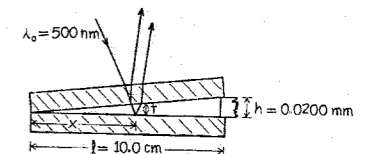
四、The right figure shows a simple alternator, a device that generates an emf. A rectangular loop is rotated with constant angular speed ω about the axis shown. The magnetic field B is uniform and constant. At time $t = 0$, $\phi = 0$. Determine the induced emf. 15%



五、Converging lenses A and B, of focal lengths 8.0 cm and 6.0 cm, respectively, are placed 36.0 cm apart. Both lenses have the same optic axis. An object 8.0 cm high is placed 12.0 cm to the left of lens A. Find the position, size, and orientation of the image produced by the lenses in combination. 15%



六、Suppose the two glass plates in the right figure are two microscope slides 10.0 cm long. At one end they are in contact; at the other end they are separated by a piece of paper 0.0200 mm thick. What is the spacing of the interference fringes seen by reflection? Is the fringe at the line of contact bright or dark? Assume monochromatic light with a wavelength in air of $\lambda = \lambda_0 = 500$ nm. 10%



七、Find the kinetic, potential, and total energies of the hydrogen atom in the first excited level, and find the wavelength of the photon emitted in a transition from that level to the ground level. ($\epsilon_0 = 8.854 \times 10^{-12}$ C² / N m², $h = 6.626 \times 10^{-34}$ J • s, $R = 1.097 \times 10^7$ m⁻¹) 10%