

國立台北科技大學九十三學年第一學期
機電科技研究所博士班（光電組）資格考試

光學試題

第一頁，共 二 頁

填學生證號碼

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注意事項：

1. 本試題共 5 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案必須答在試卷答案欄內，否則不予計分。
4. 本科目為（ ）開書考 （ $\checkmark$ ）關書考
5. 考生可以使用計算器。

總 分	
閱卷委員	

1. A light ray is incident on the left vertical face of a glass cube of index 1.50, as shown in Fig. 1. The plane of incidence is the plane of the paper, and the cube is surrounded by water of index 1.33. At what maximum angle must the ray be incident on the left vertical surface of the cube if total internal reflection is to occur at the top surface? (20%)

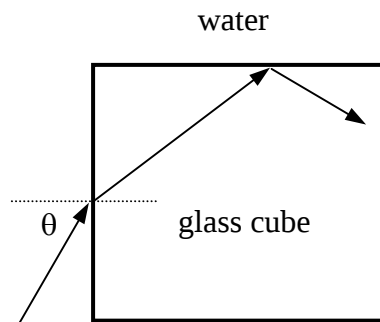


Fig. 1

2. A positive meniscus (convexo-concave) thin lens ($n=1.5$) whose radii of curvature are 5 cm and 10 cm is positioned in contact with a plano-concave thin lens ($n=1.6$) of radius 6 cm. What is the effective focal length of the lens system? Compute its power as well. (20%)

3. Imagine two crossed linear polarizers with transmission axes vertical and horizontal. Now, insert a third linear polarizer between them with its transmission axis at 45° to the vertical. Determine the emerging irradiance before and after insertion of the third polarizer in terms of I_i , the flux density of incident natural light. (20%)

4. Consider the wavefront-splitting biprism system as shown in Fig. 2. Describe how it works and derive an expression for the fringe separation (Δy) in terms of R , d , θ , n and λ , provided that the prisms (refractive index n) are very thin ($\theta \approx 1^\circ$). (20%)

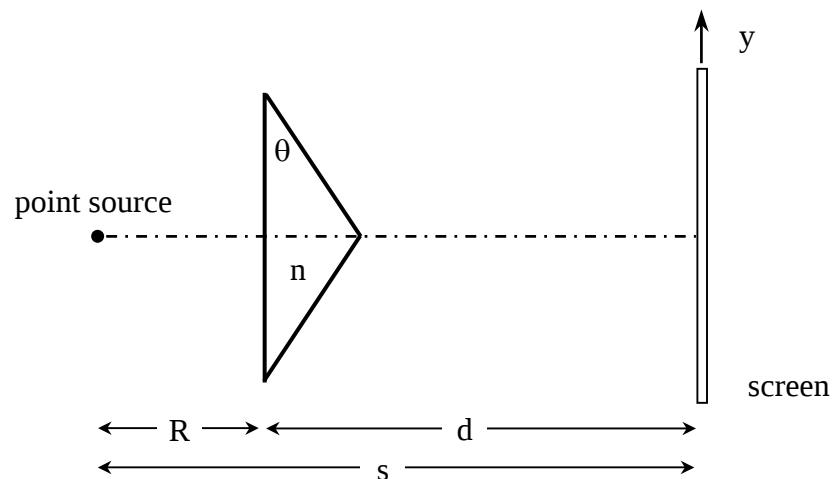


Fig. 2

5. Two pinholes 1.5 mm apart are placed in front of a bright light source and viewed through a telescope with its objective stopped down to a diameter of 4 mm. What is the maximum distance from the telescope at which the pinholes can be resolved? Assume wavelength $\lambda = 550$ nm. (20%)