所別：光電科學與工程學系碩士班 不分組(一般生)　科目：光學　共 2 頁　第 1 頁
光電科學與工程學系碩士班 不分組(在職生)

本科考試可使用計算器，廠牌、功能不拘　　＊請在試卷答案卷（卡）內作答

Section I. Sketch problems: Please make a precise sketch for the following questions. Please use ruler or a straight object to draw straight lines.

1. (15 pts) An optical plane wave with its wavefront hitting a parallel glass plate as shown in Figure 1. The incident wavelength is λ. The solid and dashed lines indicate the wavefront which has an angle θ with respect to the glass surface. The parallel glass plate has refractive index of n and its thickness is d. Regardless the interference and diffraction effect. Please sketch the wavefronts inside and outside the glass plate and label the angles

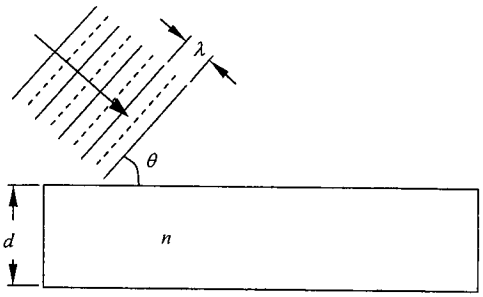

Figure 1 A plane wave illuminate a glass slab in an incline angle.

2. (15 pts) If we consider interference in problem 1, please sketch the interference pattern inside and outside the glass plate regardless the intensity of the wave. Please also give the period of the interference pattern.
3. A broom is leaning against a wall as shown in Figure 2. A lens is located at z=0 with its focal length of f. The broom position is shown in Figure 3. Regardless the size of the lens, please answer the following questions.
   a. (5 pts) Please use ray tracing to sketch the position of the image of the broom.
   b. (5 pts) Please label the a, b, c and d points on your image at a proper position with their z positions.
   c. (5 pts) How can we use this lens to form a real image of this broom if we can not move the broom?

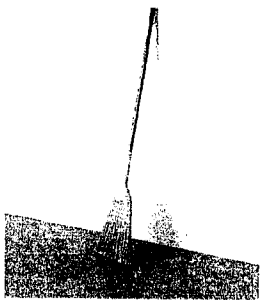

Figure 2 A broom leaning against a wall

注意：背面有試題

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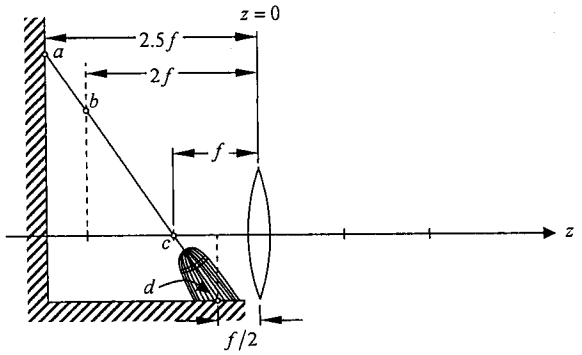

Figure 3 Arrangement of a lens to image the broom against the wall.

Section II. Brief answer problems: Please briefly explain the following question in less than 50 words each.

1. (5 pts) How to make a half-wave plate?
2. (5 pts) What is the function of a half-wave plate?
3. (5 pts) What is the difference between quarter-wave plate and half-wave plate?
4. (5 pts) Please briefly explain what is aberration.
5. (5 pts) What are the possible interactions between light with matter?

Section III. True or false questions: Simply answer the following question with truth or false. No penalty will be applied.

1. (3 pts) Young's double slit experiment can measure the temporal coherence of the incident light.
2. (3 pts) Michelson interferometer setup is to measure the spatial coherence of the incident light.
3. (3 pts) Twyman-Green interferometer is for measuring the temporal coherence of the incident light.
4. (3 pts) A linear polarized light passes through a half-wave plate will always be a linear polarized light.
5. (3 pts) Without absorption, there is no dispersion.
6. (3 pts) Two light waves with perpendicular polarizations can not have interference.
7. (3 pts) Wavefront is always perpendicular to the poynting vector direction of the wave.
8. (3 pts) Highly spatially coherent source do not necessary have high temporal coherence.
9. (3 pts) Highly temporal coherence source usually has highly spatial coherence.
10. (3 pts) White light can not achieve interference.

注意：背面有試題