



**Optical communication (610535)3**

**Instructor: Dr. Abdel-Rahman Al-Qawasmi**

**Semester: 2<sup>nd</sup> 2002/2003**

**Exam: First**

**Prerequisite: Communication II**

**Engineering Faculty**

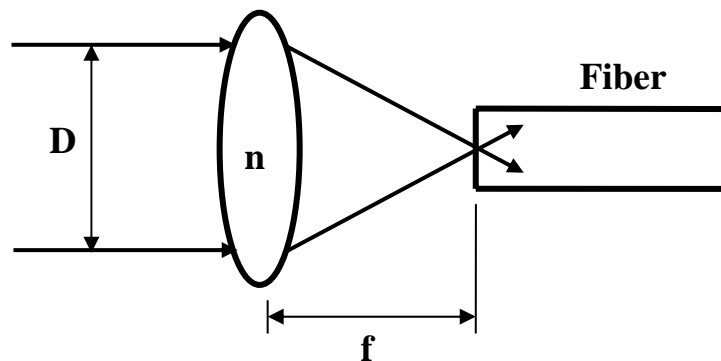
**Electrical & communication Dept.**

**Date : 6/4/2002**

**Time: 60 minutes**

**Question 1:**

Fibers can be tested by making a continuity check by observing whether any light emerges from the end of the fiber. Gas lasers are used for those tests and lens is used to focus the light onto the fiber end face.



- (a) For light of wavelength  $\lambda$ , refractive index of lens  $n$  and diameter of lens  $D$ , obtain, with explanation and defining any new symbols introduced, an equation that gives the focal length. (4 marks)
- (b) Explain: "The rod collimator would be easier to assemble, align and maintain than spherical- lens".(1 mark)

**Question 2:**

A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.5 and a cladding refractive index of 1.47.

- Determine:
- (a) the critical angle at the core-cladding inter face; (2 marks)
  - (b) the NA for the Fiber; (2 marks)
  - (c) the Brewster angle at the air-fiber boundary. (2 marks)  
(Refractive index for air=1)

**Question 3:**

Briefly explain the following statements:

- (a) The internal reflection at the core boundary should be high.(1 mark)
- (b) The all plastic fiber is used for a short transmission path.(1 mark)
- (c) For long path, fiber cables are cheaper to transport and easier to install than metal cables.  
(Give an Example).(2 marks)

**Question 4:**

Show that the coupling efficiently in generally higher SI fibers than for GRIN fibers, when each has the same core size and the same fractional refractive index Change  $\Delta$ . (5 marks)