



Applied Physics 2 - Dec 17

First Year Engineering (Semester 2)

Total marks: 80

Total time: 3 Hours

INSTRUCTIONS

(1) Question 1 is compulsory.

(2) Attempt any **three** from the remaining questions.

(3) Draw neat diagrams wherever necessary.

- 1.a.** Why Newtons Rings are circular and centre of interference pattern is dark? (5 marks)
- 1.b.** What is Rayleigh's criteria resolution? How to increase resolving power diffraction grating? (5 marks)
- 1.c.** Calculate the V number of an optical fibre having numerical aperture 0.25 and core diameter 20 m, if its operating wavelength is $1.55 \mu\text{m}$. (5 marks)
- 1.d.** What is pumping in Laser? Give the types of pumping. (5 marks)
- 1.e.** Show that the divergence of the curl of a vector is zero. (5 marks)
- 1.f.** Determine the magnetic field required to bend a beam consisting of electron of speed $3 \times 10^7 \text{m/s}$ in a circle of radius 5 cm. (5 marks)
- 1.g.** What will be the fringe pattern if wedge shaped air film is illuminated with white light? (5 marks)
- 2.a.** Obtain the condition for maxima and minima of light reflected from the transparent film of uniform thickness. Why is the visibility of the fringe much higher in the reflected system than in transmitted system (5 marks)
- 2.b.** What is the numerical aperture? Explain the use of optical fibre in temperature sensor. The core diameter of a multimode step index fibre is $50 \mu\text{m}$. The numerical aperture is 0.25. calculate the number of guided modes at an operating wavelength of $0.75 \mu\text{m}$. (5 marks)
- 3.a.** Explain the experimental method to determine the wavelength of spectral line using diffraction grating. What is the highest order spectrum which can be seen with monochromatic light of wavelength 6000 \AA by means of a diffraction grating with 5000 lines/cm? (10 marks)
- 3.b** Explain construction and working of Nd:YAG laser. (10 marks)
- 4(a)** Explain Spherical co-ordinate system. State the transformation relation between Cartesian and Spherical co-ordinates. (5 marks)
- 4(b)** Explain construction and working of cathode ray tube. (5 marks)
- 4(c)** A wedge shaped film having angle of 40 seconds is illuminated by monochromatic light. Fringes are observed vertically through a microscope. The distance between 10 consecutive dark fringes is 1.2 cm. find the wavelength of monochromatic light is used. (5 marks)



- 5(a)** Explain the construction and working of of Atomic Force Microscope. Compare AFM with scanning electron microscope (5 marks)
- 5(b)** Derive Maxwells two general equations in integral and differential form. (5 marks)
- 5(c)** An electron is accelerated through a potential difference of 5 kV and enters a uniform magnetic field of 0.02 Wb/m^2 acting normal to the direction of electron motion. Determine the radius of the path. (5 marks)
- 6(a)** What are the different methods of synthesis of nano materials? Explain one of them in detail. (5 marks)
- 6(b)** . What is holography? Differentiate between holography and photography. (5 marks)
- 6(c)** Describe in detail the concept of anti reflecting film with a proper ray diagram. (5 marks)