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S-3774

M. Sc. (Tech.) (Part - I) (Sem. I) Examination

March / April – 2011

INS-114 : Optical & Analytical Instrumentation : Paper-IV

(Instrumentation) (New Course)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :
☛ **M. Sc. (TECH.) (PART - 1) (SEM. 1)**

Name of the Subject :
☛ **INS-114 : OPTICAL & ANALYTICAL INSTRUMENTATION-4 (NEW)**

☛ Subject Code No. : **3 7 7 4** ☛ Section No. (1, 2,.....) : **NIL**

Seat No. :

Student's Signature

(2) All questions carry **equal** marks.

(3) Use programmable calculator is allowed.

(4) Assume suitable data whenever necessary.

1 Answer any **two** : **14**

(a) State the basic components of LASER and explain each in detail. **7**

(b) Discuss the advantages of optical fibers over the conventional metallic fibers. **7**

(c) Explain the working of transmission electron microscopy. **7**

2 Attempt any **two** : **14**

(a) What is diffraction ? Explain X-ray diffraction in crystals. **7**

(b) Explain construction and working of Ruby Laser. **7**

(c) Discuss the applications of optical fiber in medical field **7**

3 Answer any **two** : **14**

(a) Explain the term level of the laser. Derive the equation for laser rate for three level laser. **7**

(b) Explain the propogation of light in fiber using ray model. **7**

(c) Discuss the working of NMR. **7**

4 Attempt any **two** : **14**

(a) (i) A laser beam having a wave length of 400 nm and an aperture of 0.25 cm is sent to identify an object. Calculate the angular spred and the area of spred of the beam. Given distance between the laser source and object is 10 km. **7**

(ii) Discuss the characteristics of laser in brief.

(b) (i) An optical fiber has NA of 0.25 and a cladding refractive index of 1.49. Determine the acceptance angle of the fiber in water which has refractive index 1.33. **7**

(ii) Discuss the differences between step index and gradded index fiber.

(c) The power rating of an X-ray machine is 50 kV. **7**

(i) Calculate the shortest wavelength produced by machine.

(ii) If $d = 3.14 \times 10^{-14}$ mm what will be the glancing angle for the first order reflection from of cube of kcl having molecular mass 74.6 and density $1.99 \times 10^{3}\ Kg/m^{3}$.

5 Answer following question compulsory: **14**

(a) Discuss the application of laser in material processing and Lidar. **7**

(b) Explain the working of tunneling scanning microscope. **7**