



M.Sc. IV Semester Degree Examination, Sept./Oct. - 2024

PHYSICS

Lasers and Optical Fibers

(NEP)

Time : 3 Hours

Maximum Marks : 70

Note : Answer **any five** of the following questions with Question **No.1** is **(Q1)** is **Compulsory**, each question carries **equal** marks.

1. (a) With a neat diagram, explain the construction and working of edge emitting semiconductor Laser. **9**
- (b) Discuss the applications of Lasers in thermonuclear reaction. **5**
2. With a neat diagram explain the production of giant pulses using mechanical and electro optical shutters. **14**
3. (a) Discuss the classical treatment of hyper-Raman effect. **5**
- (b) Describe the experimental procedure used for the studies in saturation spectroscopy. **9**
4. (a) Discuss the fabrication of an optical fibre using vapour oxidation process. **9**
- (b) A silica optical fibre has a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine (i) the critical angle at the core-cladding interface; (ii) the numerical aperture for the fibre. **5**
5. (a) Give an account of linear and non-linear scattering losses of optical fibres. **9**
- (b) Write a brief note on LED characteristics. **5**
6. (a) Discuss the Photo-acoustic Raman technique for detecting laser absorption. **9**
- (b) Give an account on surface enhanced Raman spectroscopy. **5**



7. (a) Explain the types of optical fibres with their refractive index profile. **7**
- (b) Discuss the construction and working of surface emitter type of LED source for optical fibres. **7**
8. (a) Describe the experimental arrangement used to study the Doppler-free two photon spectroscopy. **5**
- (b) Discuss briefly the applications of optical fibres in temperature and pollution sensors. **5**
- (c) The mean optical power launched into an 8km length of fibre is $120\ \mu\text{W}$, the mean optical power at the fibre output is $3\ \mu\text{W}$. Determine (i) the overall attenuation in decibels; (ii) the signal attenuation per kilometre; (iii) the numerical input/output power ratio. **4**

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