M 26990

Reg. No. : .....

Name : .....



# IV Semester M.A./M.Sc./M.Com. Degree (Reg./Sup./Imp.) Examination, March 2015

## PHYSICS

## PH 402 : Optics

Time : 3 Hours Max. Marks : 50

### SECTION – A

Contains **four** questions of which answer **any two**, **each** carry **10** marks.

1. Explain the theory of three level laser system using the rate equations.
2. Explain the working of a CO2 laser Mention any two advantages this laser.
3. What is meant by coherence and how the coherence time and line width are calculated by Fourier analysis.
4. a) Explain the propagation of light in optical fibers.
   b) Write a note on the materials used for the construction of the optical fibers. **(2×10=20)**

### SECTION – B

Contains **eight** questions of which answer **any five** questions **each** carry **3** marks.

5. Explain temporal coherence.
6. Explain the significance of the Einstein's coefficient.
7. Explain the Mode locking.
8. Write a note on Fabrey Perot resonator.
9. What do you mean by spatial frequency filtering ?

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10. Write a note on the material dispersion in optical fibers.

11. Explain the working principle of Dye laser.

12. Explain "Optical mixing". **(5x3=15)**

## SECTION – C

Contains **five** questions of which answer **any three** question and **each** question carry **5** marks.

13. A certain optical fibre has an attenuation of 3.5 dB/km at 850 mm. If 0.5 mW of optical power is initially launched into the fibre what is the power level in $\mu$W after 4 km.

14. A step index multimode fiber has a core of index 1.5 and a cladding index of 1.798. Find :
    a) the intermodal dispersion factor for the fibre
    b) the total dispersion in 18 km length
    c) the maximum bit rate allowed assuming dispersion limiting

15. Consider a periodic function of the form $f(t) = t$ for $-\tau < t < \tau$
    and $f(t + 2n\tau) = f(t)$
    Expand the above function a Fourier series.

16. Quasimonochromatic source emits radiation of mean wavelength 5461 AU and a has a bandwidth $10^9$ Hz. Calculate :
    a) coherence time
    b) coherence length
    c) frequency stability.

17. Calculate the ratio of spontaneous emission to stimulated emission by an incandescent bulb at 2000 K. Take $v = 6 \times 10^{14}$ Hz. **(3x5=15)**