ST.JOSEPH’S COLLEGE (AUTONOMOUS), BANGALORE-27

B.Sc. PHYSICS – IV SEMESTER

SEMESTER EXAMINATION- APRIL 2018

PH 412 - Electromagnetics, Sound and Physical Optics

Time: 3hrs Max.Marks:100

This question paper has TWO printed pages and THREE parts

PART-A

Answer any four of the following: (5x12=60)

 1. a) State and prove Malus’ law

 b) Discuss the theory of retarding plates and show under what condition circularly               polarized light is obtained. (4+8)

 2. a) Using Fermat’s principle,derive Snell’s law of refraction.

 b) Write a short note on spherical aberration. (8+4)

 3. a) Explain spontaneous and stimulated emission mechanisms.

 b) With the help of a neat diagram, explain the working of ruby laser with energy

 level diagram. (4+8)

 4. a) State and explain Faraday’s laws of electromagnetic induction.

 b) Derive e = -dØ/dt with usual notation. (6+6)

 5. a) Obtain an expression for the growth of current in an LR circuit.

 b) Derive an expression for the current in an LCR circuit to which ac voltage is

 applied, by the vector method. (6+6)

 6. a) What is a rectifier? With a neat circuit diagram, explain the working of a full-wave                 rectifier

 b) Obtain the efficiency of a full wave rectifier. (8+4)

 7. a) What is an optical fibre? Explain different types optical fibres and its uses.

 b) State and Explain laws of thermo electricity. (6+6)

PART-B

 Solve any four of the following: (4x5=20)

 8. An inductance of 10 H is connected in series with a resistance of 50Ώ to a 220 V,

 50 Hz ac source. Calculate the value of the capacitance to be connected in series to            power factor unity. Also calculate the current in the circuit.

 9. The power of He-Ne laser is 3 mW, which emits 9.55 x 1015 photons per second.

 Calculate the wavelength of laser.

 10. A coil of self inductance 10 H and having 100 turns carries a current of 4 A.

 What is the energy stored in the coil? What will be the induced emf in it, if

 The current changes at 300 A/s.

 11. A 0.22 m long polarimeter tube containing a certain solution of concentration

 20% produces an optical rotation of 24°. Find the specific rotation of the solution.

 12. The core and cladding refractive indices of an optical fibre are 1.53 and 1.42 respectively.

 Calculate its critical angle, numerical aperture and acceptance angle.

 13. A half wave rectifier is employed to supply 45V dc. If the resistance of the diod is

            20Ω and the load resistance 530Ω, what should be the AC voltage at the secondary of

             transformer

 Answer any five of the following (5x2=10)

 13. a) Can Sound waves be polarized? Explain a

 b) Instead of light from LED, laser is used to conduct surgery. Why?

 c) Explain how will you increase the time constant of an CR circuit?

 d) What is the value of Xc. inductive capacitance in a dc source? Explain

 e) $ $Eddy current is often a disadvantage. Explain.

 f) What are the conditions to be satisfied to get stimulated emission?

 g) Do Joule heating and Thomson effect refer to the same phenomena? Explain.

 h) Can naked eye detect polarized light? Discuss.

 i) Laser beam is nearly ideal source of light. Justify.

 j) Is Seebeck effect a reversible phenomenon? Explain.