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

Register Number:

DATE:11-04-2017 (9 AM)

**SEMESTER EXAMINATION – APRIL 2017**

**B. Sc. PHYSICS: IV SEMESTER**

**PH 415: Optics, Electricity and Semiconductor Diodes**

**Time: 1½ hr. Max. Marks: 35**

***This question paper has 1 printed page and 3 parts***

**PART-A**

Answer any **three** of the following: [3x8=24]

1. Derive an expression for the resonant frequency and impedance at resonance of a parallel circuit with an AC source using a vector method.
2. With a circuit, explain the working of a centre-tap full wave rectifier. Derive the expressions for its ripple factor and efficiency.
3. With a neat diagram, explain the construction and working of a ruby laser with the relevant energy level diagram.
4. Explain with diagrams different types of optical fibre with respect to refractive index. Mention their importance.

**PART-B**

Solve any **two** problems. [2x4=8]

1. A circuit has an inductance of 20mH, capacitance of 0.5μF and a resistance of

1kΩ with an emf of 1kV connected in series. Is the circuit oscillatory?

Calculate the final charge on the capacitor.

1. In a zener diode voltage regulator, the breakdown voltage of diode is 10V. If the series resistance is 1kΩ and load resistance is 2kΩ, what will be the variation in zener diode current when the input voltage changes from 40V to 22V?
2. Calculate the ratio of spontaneous emission to stimulated emission rates for an optical source at 1000K emitting wavelength 600nm.

**PART-C**

1. Answer any **three** of the following: [3 x1=3]

a). What is the nature of discharge through the LC circuit with dc source?

b). Why chokes are preferred to resistors in household fittings?

c). Why series LCR circuit is called an acceptor circuit?

d). If numerical aperture of an optical fibre is more, what does it mean?

e). Radiation by stimulated emission is coherent while spontaneous is incoherent. Why?

PH-415-C-17