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

**B.Sc. PHYSICS - IV SEMESTER**

**SEMESTER EXAMINATION: APRIL 2019**

**PH415: Optics, Electricity and Semiconductor Diodes**

**Time - 1 ½ hrs Max Marks - 35**

**This paper contains two printed page and three parts**

**PART A**

**Answer any three of the following: - 3 x 8 = 24**

1. With a neat diagram, describe the construction and working of Ruby

laser with the relevant energy level diagram. (1+7)

1. a) Derive expressions for impedance and current at resonance,

    when inductance, capacitance and resistance are connected in series.

b) Define quality factor and bandwidth of a circuit. (6+2)

1. a) Describe the working of a centre-tap full wave rectifier with necessary

circuit diagram.

b) Define ripple factor and derive expression for the same. (5+3)

1. a) List out the differences between step index and graded index of optical fibre.

b) What is numerical aperture and derive the relation between numerical

     aperture  and fractional index change. (5+3)

**PART B**

**Answer any two of the following: - 2 x 4 = 8**

1. A condenser of capacity 0.01µF is discharged through an inductance of 10mH and a resistance of 1KΩ. Calculate the frequency of oscillation. What is the additional resistance that should be included in the circuit so that the oscillations may just stop?

**OR**

A 24V, 600 mW Zener diode is to be used for providing a 24V stabilised supply to a variable load. If input voltage is 32V, calculate the value of series resistance Rs.

1. Estimate the order of magnitude of the standing waves in a laser when the length of the resonating cavity is 1m and the wavelength is (i) 3.3 x 10 -6 m (ii)6.328 x 10 -6 m

**OR**

A step-index fibre has a numerical aperture of 0.16,a core refractive index of 1.450 and a diameter of 90 µm. Calculate the (i) The refractive index of the cladding and

(ii) The approximate maximum number of modes with a wavelength of 0.9 µm that the fibre can carry.

**PART C**

**Answer any three of the following: - 3 x 1 = 3**

7. a) Give an advantage of using glass for making optical fibres.

           b) How does the existence of a metastable state helps in laser action?

         c) Why long distance power transmission is done through conducting

wires of high voltages?

           d) How does width of the depletion region changes, when the p-n

junction is reverse biased?

e) While charging the capacitor through a resistance how does the

current varies? Explain.

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