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| Date :09-04-2019 |  |

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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**

**SUPPLEMENTARY CANDIDATES ONLY**

**ATTACH THE QUESTION PAPER WITH THE ANSWER BOOKLET**

**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. a) Distinguish between spontaneous and stimulated emission.

b) Explain metastable state and population inversion (4+4)

1. a) What are the conditions to be satisfied for transmission of light through

an optical fibre?

b) Derive an expression for numerical aperture and acceptance angle of

an optical fibre. (2+6)

1. a) Describe the working of a Zener diode under forward and reverse bias

characteristics.

b) With the neat diagram explain the working of Zener diode voltage regulator (4+4)

1. Using Phasor diagram derive expressions for the resonant frequency and impedance at resonance, of a parallel resonance circuit with resistance in the inductance arm.

**PART-B**

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

1. An inductor of self-inductance 500mH and resistance 5Ω is connected to

a battery of negligible internal resistance. Calculate the time in which the

current will attain half of its final steady value.

**OR**

A 6V stepdown transformer is used to make a half wave rectifier. Calculate

the output dc voltage assuming the diode resistance to be negligible.

1. A fibre has a core diameter of 6 µm and its core refractive index is 1.45. The refractive index of the cladding is 1.448. Determine the maximum number of

modes allowed to propagate through the fibre, if the wavelength of light used is 1 µm.

**OR**

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

**PART-C**

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

1. a) What is the advantage of gas laser over that of ruby laser?

b) Why is a choke preferred to a rheostat in controlling the current

in an ac circuit?

c) When a p-n junction is reverse biased a small current flows through

the circuit.Why?

d) What does the time constant of the circuit signify in the case LR circuit?

e) In LC network, electromagnetic waves are setup. Justify.

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