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

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

**SEMESTER EXAMINATION: APRIL 2020**

**PH418: Optics and Electricity**

**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) Obtain the relation between the Einstein’s co-efficient of spontaneous and stimulated

emission. (2+6)

2. a) What is a V-number and how it is related to mode of propagation.

b) Mention the classification of optical fibre and explain them. (3+5)

3. Using **j**-operator method derive expressions for the resonant frequency and impedance

at resonance of parallel resonance circuit with resistance in the inductance arm. (8)

4. a) With a neat circuit diagram explain the working of Bridge rectifier.

b) Derive expressions for ripple factor and efficiency of the same. (4+4)

**PART-B**

**Answer the following: 2 x 4 = 8**

1. A condenser of capacity 0.01 µF is discharged through an inductance of 10mH and a resistance of 1000 Ω. Calculate the frequency of oscillation.

**OR**

Calculate the minimum value of RL that will turn the Zener diode on in the Zener regulator circuit . Also calculate the current through RS. Given: Vin=15V, VZ=10V, RS=1kΩ.

1. Optical fibre has a numerical aperture of 0.35, the refractive index of cladding is 1.443. Calculate the refractive index of the core and acceptance angle of the fibre.

**OR**

In a He- Ne laser, the transition from 3s to 2p level gives a laser emission of wavelength 632.8nm. If the 2p level has the energy 15.2 x 10-19 J, how much pumping energy is required assuming no loss.

**PART-C**

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

1. a) Metastable state is necessary for laser action to take place. Justify.

b) Why optical fibres are used for long distance communication?

c) Intrinsic semiconductor are seldom used. Why?

d) What is the condition for critically damped oscillation? Why it is called so?

e) During the breaking of a LR circuit why the spark does occur across the air gap. .