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

DATE:

B.Sc. PHYSICS – IV SEMESTER

SEMESTER EXAMINATION: APRIL 2019

**PH 415: OPTICS, ELECTRICITY AND SEMICONDUCTOR DIODES**

**Time: 1½ hours. Max. Marks: 35**

***This question paper contains 2 printed pages and 3 parts***

**PART-A**

Answer any **THREE** questions. [3x8=24]

1. Derive the relation between Einstein’s A and B co-efficients. Mention its physical significance.

[8]

2. Obtain an expression for the acceptance angle and numerical aperture of an optical fibre.

[8]

3. a) Derive an expression for the growth of current in LR circuit with dc source.

b) Define time constant and represent graphically the growth of current at         different time constants in the LR circuit.                                                                                                                                                [5+3]

4. a) With a near circuit diagram, describe the working of a bridge rectifier.

b) Derive an expression for the efficiency of a bridge rectifier [5+3]

**PART-B**

Solve the following problems [2x4=8]

5. A ruby laser source emits a radiation of wavelength 693.4 nm. Calculate the temperature at     which rate of spontaneous to stimulated emission are equal for this wavelength.

**OR**

   An optical fibre is having a core of diameter 40μm. A light of wavelength 150 nm is launched    at one end at a maximum angle of 8.6° when it is in air. Find out the number of modes the    fibre can support when it is in water. Refractive index of water is 1.33.

6. A 12V-600 mW Zener diode is to be used for providing a 12V stabilized supply to a variable     load. If the input voltage is 20V, calculate the value of (i) series resistance (ii) diode current     when the load resistance is 1kΩ.

**OR**

   An inductance of 50 mH and a resistance of 10 Ω are connected in series to 220V-50 Hz ac    mains. Calculate the value of the current. What is the power dissipated in the circuit?

**PART-C**

Answer any **THREE** questions. [3x1=3]

7 a). What is the significance of negative temperature states in the case of laser?

b). Why an optical fibre communication is preferred over an electrical communication?

c). what is the phase angle between voltage and current at resonance in series LCR circuit?

d).Why a parallel circuit is called a rejecter circuit?

e).When a diode is reverse biased, only a small current flows through it. Explain

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