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| **ST. JOSEPH’S COLLEGE (AUTONOMOUS), BANGALORE-27** | | | | | | | | |
| **B.Sc. PHYSICS - IV SEMESTER** | | | | | | | | |
| **SEMESTER EXAMINATION: APRIL 2020** | | | | | | | | |
| **PH 418 –OPTICS AND ELECTRICITY** | | | | | | | | |
|  |  |  | | |  |  | |
| **Time- 1 ½ hrs** | | |  | **Max Marks-35** | | | | |

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

**PART-A**

Answer any **THREE** of the following. **(3x8=24)**

1. Describe the construction and working of He-Ne laser with energy level diagram.

(8)

1. i) Explain the principle of optical fibre. ii) With a neat diagram derive an expression for numerical aperture.

(2+6)

1. Alternating e.m.f. E=Eoej**ωt** is applied to a circuit containing resistance R, inductance L and capacitance C in series. Calculate the impedance and current in the circuit. Arrive at the condition for resonance. (8)

1. i) Explain the working of Zener diode as a voltage regulator.

ii) Explain load and line regulation. (4+4)

**PART-B**

Solve the following. (**2x4=8)**

1. A laser operating at 632.8nm emits 3.182x1016 photons/sec. calculate the output power of laser if the input power=100W. Also find the percentage power converted into inherent light energy.

**OR**

Calculate the V-number for a fibre of core diameter 40µm and with refractive indices of 1.55 and 1.50 respectively for core and cladding when the wavelength of the propagating wave is 1400nm. Also calculate the number of modes that the fiber can support for propagation. Assume that the fibre is in air.

1. A circuit has an inductance of 20mH, capacitance 0.5µF and a resistance of 1000Ω. Is the circuit oscillatory? Calculate the final charge on the capacitance if an emf. of 103 V is in the circuit.

**OR**

In a centre tap full wave rectifier each diode has a forward resistance of 10Ω. If the load

resistance is 1kΩ and transformer secondary voltage is 70V-0-70V, calculate the following:

i) Output d.c. voltage (ii) rms value of current . PH-418-B

**PART-C**

7. Answer any **THREE** of the following. **(3x1=3)**

1. What is the importance of using choke in an a.c circuit?

b A bulb in series with a fully charged capacitor in a dc circuit does not glow.

Give reason with the help of a graph.

1. There is no flow of current in the negative half cycle of a half wave rectifier. Why?
2. Laser welding creates stronger joints. Justify.
3. What is the fractional index change for an optical fibre with core and cladding of refractive indices 1.563 and 1.498 respectively?

PH-418-B