

**CARMEL COLLEGE OF ARTS, SCIENCE & COMMERCE FOR
WOMEN, NUVEM - GOA.**

SEMESTER END EXAMINATION, JULY 2021

**Semester: VI of B.Sc. Physics
PYC 109 Solid State Devices and Instrumentation**

Total Marks: 30 Date: 12/7/2021 Duration: 2 Hours Total No of pages: 2

Instructions:

- 1. All questions are compulsory.*
- 2. Figures to the right indicate full marks.*
- 3. Symbols have their usual meaning unless specified.*
- 4. Use of nonprogrammable calculator is permitted.*
- 5. Draw neat diagrams wherever necessary.*

Q 1) Answer any **five** of the following:

5 x 2=10

- a) What do you mean by hot carrier diode? Compare the characteristics of a hot carrier and pn junction diode.
- b) Distinguish between the photovoltaic and photoconductive mode of operation of a pn junction photodiode
- c) Draw the static current-voltage characteristic of SCR and explain its modes of operation. .
- d) What are charge couple image sensor (CCD)? Give any two uses of CCD's.
- e) Draw the block diagram of basic CRO and explain each block.
- f) What are the functions of horizontal and vertical deflecting plate system in a CRO?
- g) What are the requirements of a signal generator? Give the block diagram of a standard signal generator
- h) Explain the principal of working of linear voltage differential transformer.

Q2. Answer any **four** of the following:

5 x 4 =20

- a) Explain with a sketch why the emission of Light emitting diode can give an estimate of the band gap energy of the solid. Two LED's are excited with the same amount of electrical energy from a battery and emit the same number of photons. One of these LED's is emitting green photons at around 500 nm; and the other is emitting

red photons at around 700 nm. Which is more energy efficient in converting the electrical energy into light energy.

b) Explain with the help of neat circuit diagram the working of a DIAC-TRIAC phase control your answer

c) Draw the circuit diagram of UJT relaxation oscillator. Explain its operation with waveforms. An UJT relaxation oscillator has $R = 20\text{K}\Omega$, $C = 0.5\mu\text{f}$ and intrinsic stand off ratio $\eta = 0.7$, calculate the period of oscillation

d) Give the construction and working principle of a Q meter.

e) With the help of block diagram and waveforms discuss the operation of ramp type digital voltmeter.

f) What are the basic requirements of a transducer? Explain the construction and working of a strain gauge. Obtain an expression for the gauge factor in terms of Poisson's ratio.