CARMEL COLLEGE OF ARTS, SCIENCE & COMMERCE FOR WOMEN, NUVEM-GOA
SEMESTER END EXAMINATION, JUNE 2022

Semester: *VI* **Course name & Code:** *Solid State Devices and Instrumentation PYC 109*

Total marks: *80* **Date: 8***/6/2022* **Duration:** *2 Hours* **Total No of pages: 3**

Instructions:

1) *All questions are compulsory, however internal choice is available.*
2) *Figures to the right indicate maximum marks to the question.*
3) *Symbols have their usual meanings unless otherwise stated.*
4) *Draw neat circuit diagram wherever necessary.*
5) *Use of non-programmable calculator is permitted.*

Q 1. Answer any four of the following: 4 x 4 = 16

a) What do you mean by hot carrier diode? Compare the characteristics of a hot carrier and pn junction diode.

b) Draw the static current-voltage characteristic of SCR and explain its modes of operation.

c) What is meant by resolution of a digital instrument? State the advantages of digital instruments over analog instruments.

d) Draw the block diagram of basic CRO and explain each block.

e) What is GTO? Give the advantages of a GTO over a bipolar transistor in low power applications.

f) What are the basic requirements of a transducer? Distinguish between active and passive electrical transducer

Q 2. Answer any four of the following: 4 x 4 = 16

a) With the help of current –voltage characteristic curve explain the working of DIAC as a triggering device.

b) Distinguish between the photovoltaic and photoconductive mode of operation of a pn junction photodiode.

c) What are the functions of horizontal and vertical deflecting plate system in a CRO?

d) Explain the effects of using a voltmeter of low resistance. Why does a transistor voltmeter use FET at the input stage?

e) Explain how you would measure Impedance using Q-meter.

f) Give the different modes of operation of TRIAC.

Q 3. A. p) Explain with a sketch why the emission of Light emitting diode can give an estimate of the band gap energy of the solid. 3

q) Describe the mechanism of operation of bulk type semiconductor photoconducting cell. Draw circuit diagrams to explain any two uses. 3

OR

Q 3. A. p) What is photovoltaic effect? Draw the current-voltage characteristic of solar cell, Why does the curve fall in the fourth quadrant? 3

q) 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 and why? 3

B. What is the need for a time base generator for CRO. Explain the principle of delayed sweep CRO. 6

Q 4. A. p) Draw the current - voltage characteristics of Silicon controlled switch (SCS). Give its advantage over an SCR and any one application. 3

q) An UJT relaxation oscillator has R = 20KΩ, C = 0.5μf and intrinsic stand off ratio $\eta = 0.7$, calculate the period of oscillation. 3

OR

A. x) What is a Shockley diode? Give its basic structure and schematic symbol. 3

y) Draw the two transistor model of an SCR. State the different methods of turning ON/ OFF an SCR and explain any one. 3

B. Explain with the help of neat circuit diagram the working of a DIAC-TRIAC phase control your circuit. 6

Q 5. A. p) What are the advantages of an Aryton shunt ammeter over a multirange ammeter? Give the general requirement of a shunt resistance. 3

q) Give reasons why a transistor voltmeter cannot be used for the measurement in the microvolt range. 3

OR

A. x) Explain with necessary theory how you will convert a D'Arsonval movement into a series type ohmmeter. 3

y) Explain in brief the loading effect of voltmeter. 3

B. Give the construction and working principle of a Q meter. 6

Q 6. A. What is charge couple image sensor (CCD) and how does it work? Give any two uses of CCD's. 6

OR

A. Explain the construction and working of a strain gauge. Obtain an expression for the gauge factor in terms of Poisson's ratio. 6

B. Draw the block diagram of vertical amplifier section of a CRO, and explain different stages. 6