# G-3/388/22

Roll No. .....

## III Semester Examination, January, 2022

## M.Sc.

### PHYSICS

Paper IV

(Photonics and Op Amp)

Time : 3 Hours ] [ Max. Marks : 80

**Note :** *All questions are compulsory. Question Paper comprises of 3 Sections. Section A is objective type/multiple choice questions with no internal choice. Section B is short answer type with internal choice. Section C is long answer type with internal choice.*

**SECTION A** **1×8=8**

**(Objective Type/Multiple Choice Questions)**

Choose the correct answer :

**1.** An LED, radiation is in :
(a) Visible region
(b) Infrared region
(c) Visible and infrared region
(d) Neither visible nor infrared region

**2.** An infrared LED is usually fabricated from :
(a) Ge (b) Si
(c) GaAs (d) GaAsP

P.T.O.



**3.** Which one of the following photodetector does not provide gain ?
(a) Phototransistor
(b) Photoconductor
(c) Avalanche photodiode
(d) *p-i-n* photodiode

**4.** A solar cell operated on the principle of :
(a) Recombination (b) Photovoltaic effect
(c) Diffusion (d) Thermoelectric effect

**5.** An differential gain is :
(a) Very high
(b) Very low
(c) Dependent on input voltage
(d) Zero

**6.** A differential amplifier is :
(a) is a part of an OP-AMP
(b) has one input and one output
(c) has two outputs
(d) Both (a) and (c)

**7.** The phase in the integrator and differentiator circuit respectively are :
(a) + 90° and + 90° (b) + 90° and – 90°
(c) – 90° and + 90° (d) – 90° and – 90°

**8.** If a square wave is applied to the input of an OP AMP integrator circuit, the output would be :

(a) sine wave (b) triangular wave

(c) pulse (d) ramp

**SECTION B** **6×4=24**

**(Short Answer Type Questions)**

**Unit-I**

**1.** Explain radiative and non-radiative transitions.

*Or*

Write the advantages and disadvantages of LEDs.

**Unit-II**

**2.** Derive the expression for gain of the photoconductive detector.

*Or*

Write the advantages and limitations of Solar cells.

**Unit-III**

**3.** Draw schematic block diagram of the basic OP-AMP with inverting and non-inverting inputs. Sketch their equivalent circuits.





*Or*

What is meant by an ideal difference amplifier ? What are differential gain and common mode gain of a differential amplifier ?

**Unit-IV**

**4.** Discuss the two applications of summing amplifiers.

*Or*

Explain the operation of an OP-amp differentiator.

**SECTION C** **12×4=48**

**(Long Answer Type Questions)**

**Unit-I**

**1.** Explain the construction and working of a Light Emitting diode.

*Or*

Write note on Photoconductive devices (LDR).

**Unit-II**

**2.** What is a phototransistor ? Explain its principle of operation and give its V-I Characteristics. What are the advantages and disadvantages of a phototransistor ?

*Or*

Write notes on the following :

(a) Solar cells

(b) P-N junction solar cells

**Unit-III**

**3.** Explain DC analysis of dual input balanced differential amplifier.

*Or*

Describe voltage series feedback operational amplifier. Explain their different parameters.

*Or*

Sketch the circuit diagram of non-inverting amplifier with feedback and determine the expression for closed loop voltage gain, input resistance of OP-amp with feedback and output resistance with feedback.

**Unit-IV**

**4.** Describe the principle of oscillator and its types. Draw the Wein Bridge Oscillator circuit and derive an expression for its frequency.

*Or*

What do you mean by multivibrator ? Discuss the circuit diagram and operation of a monostable multivibrator.

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