# BPP–1099

## M.Sc. (Previous) Examination, 2022

## PHYSICS

Paper – IV

## (Electronic Devices, Computational Methods and Programming)

*Time : 3 Hours* ]                                    [ *Maximum Marks : 75*

**Section–A**                                    **(Marks : 2 × 10 = 20)**

*Note* :–    Answer all *ten* questions (Answer limit **50** words). Each question carries **2** marks.

**Section–B**                                    **(Marks : 5 × 5 = 25)**

*Note* :–    Answer all *five* questions. Each question has internal choice (Answer limit **200** words). Each question carries **5** marks.

**Section–C**                                    **(Marks : 10 × 3 = 30)**

*Note* :–    Answer any *three* questions out of five (Answer limit **500** words). Each question carries **10** marks.

**Section–A**

1.    Attempt all questions :

      (i)    What do you mean by pinch-off condition of a JFET ?

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(ii)    Define the quantum efficiency of a photodetector.

(iii)   What are SRAM and DRAM ?

(iv)    Discuss in brief electro-optic effect.

(v)     Name *two* materials exhibiting electrostriction.

(vi)    Find the decimal number corresponding to the binary number $(111.011)_2$.

(vii)   What is Gauss's central difference formulae ?

(viii)  Write Euler's method for solution of an ordinary differential equation.

(ix)    What is difference between compilers and interpreters ?

(x)     Write a program to check whether given number is even or odd either in C/or MATLAB.

## Section–B

2.  Explain working and construction of MOSFET with its characteristic curve.

### *Or*

Explain the working principle of a solar cell. Define conversion efficiency and fill factor for a solar cell.

3.  What do you mean by charge coupled devices ? Explain their working and applications.

### *Or*

What is magneto-optic effect ? Mention and explain the categories of magento-optic devices.

4.  Write a short note on Piezoelectric resonators and filters.

### *Or*

Find the real root of the equation $x^2 - 5x + 2 = 0$ by Newton–Raphson's method correct to four decimal places.

5. From the following table, find the number of students who obtain less than 45 marks :

| Marks | No. of Students |
|-------|-----------------|
| 30—40 | 31 |
| 40—50 | 42 |
| 50—60 | 51 |
| 60—70 | 35 |
| 70—80 | 31 |

*Or*

Derive the Lagrange's interpolation formula.

6. Evaluate :

$$\int_0^6 \frac{dx}{1+x^2}$$

using trapezoidal rule.

*Or*

Find $f'$ (1.5) and $f''$ (1.5) from the following table :

| $x$ | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 |
|-----|-----|-----|-----|-----|-----|-----|
| $f(x)$ | 3.375 | 7.000 | 13.625 | 24.000 | 38.875 | 59.000 |

## Section–C

7. Discuss the principle and working of CMOS and NMOS. Also compare the two.

8. What is magneto-strictive effect ? Discuss an electronic device on this effect in detail.

9. Write short notes on the following :

   (i)    Liquid crystal materials

   (ii)   Newton-Cote's formula

10. Using Runge-Kutta method, find $y$(0.2). Given that :

$$\frac{dy}{dx} = 3x + \frac{1}{2}y \text{ and } y(0) = 1 \text{ taking } h = 0.1$$

11. Write short notes on the following :

   (i)    Operating system

   (ii)   Flowchart

   (iii)  Functions in C language

   (iv)   MATLAB