2022

ELECTRONICS — HONOURS — PRACTICAL

Paper : CC-3P

(Applied Physics)

Full Marks : 30

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Marks Distribution :

LNB – 5; viva voce – 7; Experiment – 18

Candidate has to perform '***one***' of the following experiments.

1. Study the forward characteristics of a silicon p-n junction diode. From the experimental data draw the I-V curve and V vs. $ln(I)$ curve. From the slope of the curve determine Boltzmann's constant. The value of 'η' is to be supplied.

   [Theory and circuit - 3; Experimental data - 4; V vs. I Graph - 3; V vs. $ln(I)$ Graph - 3; Determination of Boltzmann's constant - 3; Discussion - 2] 18

2. Study the forward characteristics of a silicon p-n junction diode. From the experimental data draw the I-V curve and V vs. $ln(I)$ curve. From the slope of the curve, determine 'η'. The value of the Boltzmann's constant (K) is to be supplied.

   [Theory and circuit - 3; Experimental Data - 4; V vs. I Graph - 3; V vs. $ln(I)$ Graph - 3; Determination of η – 3; Discussion -2] 18

3. Study the forward characteristics of LEDs of two different colours. From the experimental data, draw the I-V curve and find the cut-in voltage for each LED. Using the cut-in voltage determine the Planck's constant for each LED. Wavelength (λ) of each LED is to be supplied.

   [Theory and circuit - 3; Experimental Data - 3+3; V vs. I Graph - 2+2; Determination of cut-in voltage - 1+1; Determination of Planck's constant - 1+1; Discussion - 1] 18

4. Study the forward characteristics of LEDs of two different colours. From the experimental data draw the I-V curve and find the cut-in voltage for each LED. Using the cut-in voltage determine the wavelength (λ) of the corresponding LEDs. Value of Planck's constant (h) is to be supplied.

   [Theory and circuit - 3; Experimental Data - 3+3; V vs. I Graph - 2+2; Determination of cut-in voltage - 1+1; Determination of wavelength - 1+1; Discussion - 1] 18

5. With the help of 'Four Probe Method' find out the resistivity of a Germanium/Silicon crystal at five different temperatures, ranging from room temperature to 200°C. Also draw a temperature vs. Resistivity curve.

   [Theory and circuit - 4; Experimental Data - 6; Resistivity Calculation - 3; Temp. vs. Resistivity Graph - 3; Discussion - 2] 18

6. Determine the first 10 energy (in eV) eigenvalues for a one-dimensional infinite potential well of width 5 nanometer. Draw Energy (E) vs. Order number (n) curve for three different widths. Perform the experiments using simulation.

   [Theory - 3; Simulation Program - 6; Systematic data recording - 6; Graph - 3] 18

7. A potential barrier of height V(eV) and width 'a' (in pieometer) is presented to a free particle of energy E(eV) while $E < V$. Find the probability of the barrier penetration or Transmission probability (T) with the help of simulation. Draw the T vs. a curve for values ranging from 100 picometer to 500 picometer. Perform the simulation for $V = 10$ eV, $E = 7$, 8 and 9 eV.

   [Theory - 3; Simulation Program - 6; Systematic data recording - 6; Graph - 3] 18

2022

ELECTRONICS — HONOURS — PRACTICAL

Paper : CC-4P

(C Programming and Data Structures)

Full Marks : 30

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Marks Distribution :

Laboratory Notebook – 5 marks.

viva voce – 7 marks

Experiment – 18 marks.

Questions for experiment :

Each question below carries 9 marks.

Answer ***any one*** question.

1. (a) Write and execute a C program to generate a Fibonacci series of numbers starting from 0 up to a number N. Read in the value of N from the keyboard. Print the value of each term in the series.
Marks distribution: Program: 5 Execution: 2 Result: 2

(b) Write a C program to find the roots of a quadratic equation: $px^2 + qx + r = 0$. Read in the values of p, q and r from the keyboard and check if the coefficients are non-zero. If non-zero, calculate and print the value of the roots, else print a statement reporting the error. Take at least two sets of data.

Marks distribution: Program: 5 Execution: 2 Result: 2

2. (a) Write and execute a C program to generate a Fibonacci series of numbers starting from 0 up to a number N. Read in the value of N from the keyboard. Calculate and print the sum of all the terms in the series.

Marks distribution: Program: 5 Execution: 2 Result: 2

(b) Write and execute a C program to the find the value of sin θ by expressing it as an infinite series. Use the keyboard to read in the value of θ in degrees and the number of terms N of the series taken into consideration. Take at least four sets of data.

Marks distribution: Program: 5 Execution: 2 Result: 2

3. (a) Write and execute a C program to find the minimum and maximum of a set of positive numbers. Read in the numbers from the keyboard. Take at least four sets of data.

   Marks distribution: Program: 5 Execution: 2 Result: 2

   (b) Write and execute a C program to find the value of cos θ by expressing it as an infinite series. Use the keyboard to read in the value of θ in degrees and the number of terms N of the series taken into consideration. Take at least four sets of data.

   Marks distribution: Program: 5 Execution: 2 Result: 2

4. (a) Write and execute a C program to find the Greatest Common Divisor (GCD) of two integer numbers M and N. Read in the numbers M and N from the keyboard. Print the GCD of the two numbers. Take at least two sets of data.

   Marks distribution: Program: 5 Execution: 2 Result: 2

   (b) Write a C program to create and display a singly linked list. The number of nodes and the values of the data in each node are to be read from the keyboard.

   Marks distribution: Program: 5 Execution: 2 Result: 2

5. (a) Write and execute a C program to find the factorial of a positive integer number N with or without using recursion. Read in the value of N from the keyboard. Print the value of the factorial. Take at least four sets of data.

   Marks distribution: Program: 5 Execution: 2 Result: 2

   (b) Write and execute a C program to sort an array of N numbers in ascending or descending order using the *Bubble-sort* algorithm. Read in the value of N and the numbers to be sorted from the keyboard. Print the sorted array. Take two sets of data.

   Marks distribution: Program: 5 Execution: 2 Result: 2

6. (a) Write and execute a C program to find the prime numbers up to an integer number N. Read in the value of N from the keyboard. Print the values of the prime numbers as also the count of the number of prime numbers up to N. Take at least four sets of data.

   Marks distribution: Program: 5 Execution: 2 Result: 2

   (b) Write and execute a C program to find the sum and difference of two matrices of order $m \times n$. Read in the values of m, n and the elements of the two matrices from the keyboard. Print the resultant matrix on the screen. Take two sets of data each for the sum and the difference.

   Marks distribution: Program: 5 Execution: 2 Result: 2

7. (a) Write and execute a C program to find the transpose of a given matrix A of order M×N. Read in the values of M, N and the matrix elements from the keyboard. Print the resultant matrix.

Marks distribution: Program: 5 Execution: 2 Result: 2

(b) Write and execute a C program to obtain the sum of the principal diagonal elements of a square matrix A. Read in the order of the matrix and the matrix elements from the keyboard and print the result.

Marks distribution: Program: 5 Execution: 2 Result: 2

8. (a) Write and execute a C program to find the product of two matrices of order m × n and p × q respectively where n=p. Read in the values of m, n, p, q and the elements of the two matrices from the keyboard. Print the resultant matrix on the screen. Take at least two sets of data.

Marks distribution: Program: 5 Execution: 2 Result: 2

(b) Write a C program to define a structure type: *struct student,* that would contain a student's name, roll number, subject and the marks obtained. Declare a student variable of type *struct student* and read in the name, roll number, subject and marks for this student variable from the keyboard and print the same on the screen.

Marks distribution: Program: 5 Execution: 2 Result: 2
