2021

ELECTRONICS— GENERAL

Paper : SEC-A-1

(Computational Physics)

Full Marks : 80

The figures in the margin indicate full marks.

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

Answer **Question Nos. 1** & **2** and **any four** questions from the rest.

1. Answer **any ten** questions from the following: 2×10

   (a) What is meant by GUI? Name an operating system which has GUI and an operating system that does not.

   (b) What is meant by array-indexing in Fortran? Can an array index be negative?

   (c) Name the logical operators in Fortran.

   (d) What is a subroutine in Fortran?

   (e) What is meant by double precision data type in Fortran?

   (f) What is the use of the COMPLEX data type in Fortran?

   (g) Write the relevant statements for opening a file and writing data to it in Fortran.

   (h) How are Greek symbols written in LaTeX? How do you express η and γ in LaTeX?

   (i) How can you import an image file using the '\importgraphics' command into your document in LaTeX?

   (j) Name a few document classes available with LaTeX.

   (k) How can you set the axes ranges in Gnuplot?

   (l) How can you insert a Title and X and Y axes labels into your plot using Gnuplot?

2. Answer **any four** questions from the following: 5×4

   (a) Write the coordinate-transformation equations to convert 3-dimensional cartesian coordinates (x, y, z) to cylindrical polar coordinates (r, θ, Φ) and draw a flowchart to implement the transformations.

   (b) Name the data types used in Fortran. Give two examples of each.

Please Turn Over

(c) What do the following linux commands do?

    (i) mkdir

    (ii) mv

    (iii) rm

    (iv) grep

    (v) cd

(d) What do the following MS-DOS commands do?

    (i) cls

    (ii) dir

    (iii) type

    (iv) md

    (v) chkdsk

(e) What are the different 100p constructs in Fortran? Give examples.

(f) Name the different font-families in LaTeX and write down the corresponding LaTeX commands.

(g) How can you perform curve-fitting to a data set in Gnuplot?

3. Write a program in Fortran to print all odd natural numbers between 1 and N. The number N is to be read from the keyboard.   10

4. Write a program in Fortran to calculate and print the maximum and minimum of a given set of numbers which are to be read from the keyboard.   10

5. Write the algorithm and the corresponding program in Fortran to find the area of a triangle with sides a, b. c.

    10

6. Write the LaTeX source code to display the following expressions: 10

(i) $\displaystyle \lim_{n\to\infty} \sum_{k=1}^{n} \frac{(-1)^{k-1}}{k} = ln(2)$

(ii) $\displaystyle \int_{0}^{x} f(y)dy = \sin x$

7. What is a preamble in a LaTeX document? Name a few classes of documents used in LaTeX and their uses. Also name a few text-styles used in LaTeX.   10

8. Assuming you have a 4-column data saved in a file named 'data.dat', write the Gnuplot source code to plot (2*column 1) versus (column 2 + column 3/column 4). Give a title. Label the axes. Save the on-screen plot to an image file in png format.   10

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