

2021

ELECTRONICS — GENERAL

Paper : SEC-A-1

(Computational Physics Skills)

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 no. 1** and **any four** questions from **question no. 2** to **question no. 7** and
any four questions from **question no. 8** to **question no. 13**.

1. Answer **any ten** questions from the following : 2×10
 - (a) What does the PARAMETER statement do in Fortran?
 - (b) Is Fortran an Object Oriented Language? Explain your answer.
 - (c) Differentiate between ‘if ... then’ and ‘do ... while’ statements in Fortran.
 - (d) What is meant by operator precedence in Fortran?
 - (e) Differentiate between real and double precision data types in Fortran.
 - (f) How does one represent a comment line in Fortan?
 - (g) Write the syntax for opening a file and writing data to it in Fortran.
 - (h) How do you represent α , δ , τ and μ in LaTeX?
 - (i) How can you import an image file using the importgraphics command into your document in LaTeX?
 - (j) What is a Gnuplot script and how is it useful?
 - (k) How can you set the axes ranges in Gnuplot?
 - (l) How can you plot multiple figures on the same screen using Gnuplot?
2. What does FORTRAN stand for? State and explain the important features of Fortran. 5
3. What is an array? How is an array declared and initialized in Fortran? Explain with an example for a one-dimensional and with another example for a two-dimensional array. 5
4. What are subprograms in Fortran? What are the different types of subprograms? Give one example of each. 5
5. Name a few keywords in Fortran. What is the use of the data statement? Explain with an example. 5

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6. Name a few branching constructs in Fortran. Give examples. 5
7. What is the difference between TeX and LaTeX? How does LaTeX differ from MS Word? 5
8. What is the use of the splot command in Gnuplot? Explain with an example. 10
9. Write the algorithm and the corresponding program in Fortran to find the two real roots of a quadratic polynomial equation. The coefficients of the given quadratic polynomial function are to be read from the keyboard. 10
10. Write the algorithm and the corresponding program in Fortran to find the product of two matrices of appropriate sizes. The size of the matrices and the values of the matrix elements need to be read from the keyboard. 10
11. Write the algorithm and the corresponding program in Fortran to find the value of the following sum of terms : $1^3 + 2^3 + 3^3 \dots n^3$. Read the value of n from the keyboard. 10
12. Write the LaTeX source code to display the following series expansion for $\sin x$: 10

$$\sin x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!} = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$$

13. Use Gnuplot to plot the following x-y pairs of data points : {0.0 : 0.0, 1.0 : 1.2, 2.0 : 1.9, 3.0 : 3.1, 4.0 : 3.8, 5.0 : 5.2}. Next, fit the data-points with a straight line using Gnuplot and plot the best-fitted straight line. Save the on-screen plots to a single image file. 10
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