

**2020**

**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) Name two text-editors in Linux.
  - (b) Name a few different flavours of Linux.
  - (c) What is a Linux shell?
  - (d) What does DOS stand for?
  - (e) What is the main difference between Linux and MS Windows?
  - (f) Name two word-processing applications in Linux.
  - (g) Name the logical operators used in Fortran.
  - (h) What is a subroutine in Fortran?
  - (i) Where is the DIMENSION statement used in Fortran?
  - (j) What is the preamble of a LaTeX document?
  - (k) What is the role of the graphics package in LaTeX?
  - (l) How do you write  $\int_1^2 x dx$  using LaTeX?
2. Answer **any four** questions from the following :
- (a) What is an algorithm and what is a flowchart? Name the different symbols used in a flowchart. 2+3
  - (b) Draw a flowchart to depict the conversion from cartesian coordinates  $\{x, y, z\}$  taken as inputs, to spherical polar coordinates  $\{r, \theta, \phi\}$  to be printed as outputs. 5
  - (c) Write the expression for the two roots of a quadratic equation  $ax^2 + bx + c = 0$ , where  $a, b, c$  are constants ( $b^2 - 4ac > 0$ ). Draw a flowchart depicting the steps behind obtaining the roots from the formula. 5

**Please Turn Over**

- (d) What is the role of the following Linux commands?  
cp, vi, pwd, ls, rmdir. 1×5
- (e) What does the word FORTRAN stand for? What is the role of the “implicit none” statement at the beginning of a Fortran program? Name a few keywords in Fortran. 1+2+2
- (f) What is LaTeX? How is it different from MS Word? Name the different document classes in LaTeX. 1+1+3
3. Write a complete Fortran program to find the two roots of a quadratic equation  $ax^2 + bx + c = 0$ , where  $a, b, c$  are constants ( $b^2 - 4ac > 0$ ). The values of  $a, b, c$  are to be read in from the keyboard. 10
4. What are the different types of loop constructs in Fortran? Explain each type with small Fortran program segments. 2+8
5. What are arrays in Fortran? How do you declare a two-dimensional array in Fortran? Write a complete Fortran program to add two  $2 \times 2$  matrices using arrays. 2+2+6
6. Write a complete Fortran program to print all even numbers between 2 and 20. 10
7. Write a complete Fortran program to compute the mean and standard deviation of a given set of numbers. 10
8. What is Gnuplot? Write the Gnuplot source code to plot
- (i) a given set of data points (saved in a file) using dashed lines and points.
  - (ii) the function  $f(x) = \sin(x) \cdot \cos(x)$  between  $-1$  and  $+1$ . 2+4+4
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