BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: I.M.Sc.   SEMESTER: III
BRANCH: PHYICS   SESSION: MO/2023

SUBJECT: SEC303 COMPUTATIONAL PHYSICS SKILLS

TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. **Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data handbook/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Describe various elements of a flowchart using an exemplary algorithm which checks if an input integer is greater than 10 or not.	[5]	1	1,2
Q.1(b)	Draw the flowchart to print the sum of all even integers up to N.	[5]	1	3
Q.2(a)	Using specific example, describe the structure of a nested IF block (conditions) in FORTRAN90.	[5]	2,3	1,2
Q.2(b)	Write a FORTRAN90 code to calculate how far will the particle of mass $m = 1$ kg land (distance travelled) when projected with initial velocity $u = 10$ m/s incident at an angle 30° with respect to ground.	[5]	2,3	3
Q.3(a)	Write a FORTRAN90 code to generate data of the time dependence of the angle made by a simple pendulum with small oscillations.	[5]	2,3	2,3
Q.3(b)	Write a Gnuplot script (sequence of commands) to plot $f(x) = \sin(x)$ between $x = 0$ and $x = 2\pi$, showing only the curve (line). Label the curve as 'f(x)'. Explicitly mention/choose appropriate parameter values for the linewidth, linecolor, and linetype.	[5]	4	1,2
Q.4(a)	Write a FORTRAN90 code to (I) calculate x^2 for $x = [0,1,2,3,4,5,6,7,8,9]$. (ii) For each value of x^2 thus obtained, add a random number uniformly distributed between $[-0.1, 0.1]$. Write the outputs to a file 'data.txt' such that the tab separated columns contain x , x^2 and the randomized x^2 values.	[5]	2,3	3,4
Q.4(b)	Using Gnuplot, fit the data using the function $f(x) = ax^2 + b$. Plot the randomized x^2 data points from the file 'data.txt' obtained above and $f(x)$ (using Gnuplot).	[5]	4	3,4
Q.5(a)	Describe the structure of a basic LaTeX document belonging to the documentclass 'article'.	[5]	5	2,6
Q.5(b)	Discuss different types of environments in a LaTeX document with examples.	[5]	5	2,6

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