18P212   (Pages: 2)   Name:……………………..

Reg. No:…………………..

SECOND SEMESTER M. Sc. DEGREE EXAMINATINS, APRIL 2019

(Regular/Supplementary/Improvement)

(CUCSS PG)

(Physics)

CC17P PHY2 C08 - COMPUTATIONAL PHYSICS

(2017 Admissions onwards)

Time: Three Hours   Maximum: 36 Weightage

Section A

Answer *all* questions. Each question carries 1 Weightage.

1. Explain the input methods for numbers and strings in Python.

2. Write the precedence rule of operators used in Python.

3. What is the difference between index of list and key of dictionary in 'Python'?

4. Write a program to make an array a = [2, 3, 4, 5] and copy it to b. Change one element of b and print both.

5. Explain with an example the method of creating a matrix and obtaining its trace.

6. Bring out the difference between subplot (m, n, N) and text (x, y, 'string').

7. Distinguish between bar () and barh () functions in 'matplotlib'.

8. Explain the Euler's method of solving ordinary differential equations and comment on the errors in it.

9. Explain the role of simulation studies in today's Physics.

10. Define a two-point boundary value problem and state any two methods of solving it.

11. Find out the cube root of 11 using Newton – Raphson method.

12. Write down the differential equation for simple harmonic oscillator. Reduce it in to first order equations for numerical solution by Euler method.

(12 × 1 = 12 Weightage)

Section B

Answer any *two* questions. Each question carries 2 Weightage.

13. What is an array in 'Python'? Explain the methods of creation, modification, printing, saving and restoring of arrays with an example. Explain any two arithmetic operations with arrays.

14. (a) Explain the least square curve fitting method for linear functions of two variables. How can you extend the method for functions for three variables?

(b) Certain experimental values of x and y are as follows. (0, -1), (2, 5), (5, 12), (7, 20). Find the equation of the best straight line that fit to the data.

15. (a) Explain the differences between Runge-Kutta second order and forth order methods.

(b) Solve $(dy/dx) = x^2 + y^2$ with an initial value $y(1) = 0$. Estimate $y(2)$ with step size of 0.25 using Runge-Kutta forth order method.

16. Briefly explain Monte- Carlo simulation method. Explain the method of determining the value of π using Monte- Carlo simulation. Write a 'Python' program for the same.

(2 × 6 = 12 Weightage)

Section C
Answer any *four* questions. Each question carries 3 Weightage.

17. Create a script that will convert Celsius to Fahrenheit. The program should ask the users to enter the temperature in Celsius and should print out the temperature in Fahrenheit, using $F = \frac{9}{5} C + 32$

18. Explain with examples any three array modification operations.

19. Find the real root of the equation $x^3 - x - 1 = 0$ using bisection method.

20. Using matrices, find the Discrete Fourier Transform of the sequence $f_k = \{1, 2, 3, 4\}$

21. Write down a 'Python' program to plot Bessel functions.

22. Write down a 'Python' program to simulate logistic map.

(4 × 3 = 12 Weightage)

****