15U609 (Pages: 2) Name: …….………..……….

Reg. No………....………….

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2018

(CUCBCSS-UG)

CC15U PH6 E01 - COMPUTATIONAL PHYSICS

Physics - Elective Course

(2015 Admission)

Time: Three Hours Maximum: 80 Marks

Section A

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

1. What will be the output of the expression 5+2/3+5/6 in Python?
2. What will be the output of the command type(3.141) in Python?
3. Give the out put of the following Python program,
   while 1: print "hello"
4. Trapezoidal method is used for …………
5. Simpson's 1/3 method is applicable only if the number of intervals is ………….

Write True or False:

6. Python is an example of low level language.
7. Python requires variable declaration statements.
8. Euler method is more accurate than second order Runge-Kutta method.
9. Accuracy of numerical integration can be increased by increasing interval size.
10. Numerical method is preferred over analytical method because it is more accurate.

(10x1=10 Marks)

Section B

Answer ***all*** questions. Each question carries 2 marks.

11. Distinguish between compilers and interpreters.
12. What are the different arithmetic operators in Python? Give its precedence. How the precedence can be changed?
13. Write the different steps for writing a message *Python is beautiful* to file with name *message.txt*.
14. What is meant by least square method of curve fitting?
15. Using forward difference operator, find an expression for $\Delta^2 y_0$.
16. Discuss the difference between analytical and numerical method of studying a physical problem.
17. What is the meant by discretization of a continuous variable?

(7 x 2 = 14 Marks)

Section C

Answer any ***five*** questions. Each question carries 4 marks.

18. Explain the different data types available in Python with examples.
19. Discuss with suitable examples how conditionals can be implemented in Python.

20. What are modules? Explain the different ways of using it in Python program with suitable examples.
21. Explain Runge-Kutta method for the solution of 1^{st} order differential equations.
22. Discuss the method of fitting a set of data to a straight line by the method of least squares.
23. Discuss the method of solving differential equations of physical problems using Euler method.
24. Discuss the different types of errors possible when solving physical problems using computers. **(5 x 4 = 20 Marks)**

Section D

Answer any ***four*** questions. Each question carries 4 marks.

25. Develop a Python program for checking whether the given number is a prime or not.
26. Develop a Python program to obtain the best equation of a straight line from a set of tabulated x and y data.
27. With necessary theory, discuss a Python program for finding the value of $\sin(x)$ with an accuracy of four decimal places using Taylor's series method.
28. Given $\frac{dy}{dx} = (y - x)$, where *y(0) = 2.0*. Find *y(0.4)* using second order Runge-Kutta method, with a step size of 0.1.
29. A missile is launched from a ground station. The acceleration during the first 80s of flight as recorded, is given in the following table. Compute the velocity of missile when t=80 s, using Simpson's 1/3 rule.

$t(s)$	0	10	20	30	40	50	60	70	80
a (m/s^{-2})	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

30. Discuss a method to study the motion of a stone which is dropped from a height H.
31. Explain how the motion of a particle moving under the influence of a central force can be numerically analysed. **(4 x 4 = 16 Marks)**

Section E

Answer any ***two*** questions. Each question carries 10 marks.

32. Discuss with suitable examples the different methods to implement iterative structures in Python. Explain the use of break and continue commands in this.
33. Explain the concept of forward difference table and hence derive Newton's formula for interpolation.
34. Deduce Newton-Raphson formula for the solution of algebraic equation and find the solution of $x^2 - 2x - 1$, using this method.
35. Discuss with suitable theory, how motion of a projectile can be simulated and analysed using Python. Consider the different factors affecting the motion.

(2 x 10 = 20 Marks)

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