Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 20

M.Sc. (Physics) (2018 Onwards Batch)   (Sem.–1)
COMPUTATIONAL PHYSICS
Subject Code : MSPH-415-18
M.Code : 75126

Time : 3 Hrs.   Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SEVEN questions carrying FIVE marks each and students have to attempt any SIX questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. What is object oriented language? Give example. What is meaning of case sensitive language.

2. Give example of one case sensitive and one case insensitive programming language.

3. How comments and constants values are defined in C++.

4. Write the basic structure of C++ program.

5. What is benefit of defining user defined functions in programming?

6. What is role of Cin and Cout in C++.

7. What is difference between infinite and finite loops? Give one example of each.

8. In relation to numerical methods, what is meaning of truncation error and round off error.

9. What is the order of Taylor series which is used in the derivation of Euler's methods and Runge Kutta's 4th order methods? Which of these two methods is best choice to find the solution of differential equation?

10. What is meaning of nested loops? Give example.

SECTION-B

11. What do you understand by loop branches and control flow? Explain with examples in terms of code of programming language.

12. Explain the basics of GNU plot and origin with the help of one-one examples of each.

13. Write a program along with algorithm in C++ which find the roots of a quadratic equation.

14. Write the program in C++ which add and subtract two matrices A and B.

15. Find the solution of the differential equation given below using Euler's method

$$\frac{dy}{dx} = \frac{5x2 - y}{ex - y}$$

over $0 < x \leq 0.4$. Consider the step size h = 0.1 and initial condition y(0) = 1.

16. Fit a cubic spline for the following data and find the value of function at x = 5

x	3	4.5	7	9
f (x)	2.5	1	2.5	0.5

17. Derive the expression for Simpson 1/3 rule of integration and corresponding truncation error formula.

SECTION-C

18. Derive the general Lagrange interpolation formula. Using its 2nd order form find the acceleration at time t = 18 sec of an object whose velocity v(t) as a function of time t is given by the data

t in sec	0	10	15	20	22.5	30
v(t) m/sec	0	227.04	362.78	517.35	602.97	901.67

19. Derive the Runge Kutta's 2nd order formula to find the solution of ordinary differential equations. How it is different from 4th order formula?

20. What are different arithmetic, logical, combinational operators in C++ ? List the different rules which determine the precedency and associativity of these operators. Explain each rule with suitable example.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.