

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, SEPTEMBER 2007

Physics

PHY 202- NUMERICAL TECHNIQUES AND COMPUTER PROGRAMMING

(2003 admissions)

Time : Three Hours

Maximum : 80 Marks

Section A

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

1. What is interpolation? What methods are available for interpolation?
2. Define finite difference. What is difference table?
3. Explain empirical laws and curve fitting.
4. What are the advantages Runge-Kutta method over Taylor method?
5. What are the steps involved in dynamic debugging of a program?
6. Explain with suitable example logical IF statements in FORTRAN.
7. With suitable example explain the different operators used in C.
8. What is the purpose of GO TO statement? How is it written in C?

[5 x 4 = 20 marks]

Section B

Answer **all** questions.
Each question carries 20 marks

9. (a) (i) Using Taylor series expansion obtain the Newton- Raphson formula. If a root is a repeated root then show that Newton- Raphson method converges to the root but that the convergence is first order.
(ii) Distinguish between Taylor series and Maclaurins series expansion.

Or

- (b) (i) Derive Milne's predictor formula and hence to derive Milne's Corrector Formula.

(ii) Use Milne's predictor corrector method to obtain the solution of equation $\frac{dy}{dx} = x - y^2$ at $x=0.8$, given that $y(0)=0.0000$, $y(0.2)=0.0200$, $y(0.4)=0.0795$, $y(0.6)=0.1762$.

10. (a) (i) With suitable example the rules for the DO loops in FORTRAN.
(ii) What are the difference between STOP statement and END statement in FORTRAN.

Or

- (b) (i) Explain the importance of Library function in C.
(ii) Explain in details with general format the various file operations in C. [2 x 20 = 40 marks]

Section C

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

11. Find the real root of the equation $x^4 - x - 9 = 0$ by Newton-Raphson method correct to three places of decimal.
12. Using Runge-Kutta method of fourth order solve for $y(0.1)$, given that $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$.
13. Write a program in FORTRAN to read a message and code it in such a way that each letter of the alphabet is replaced by the next letter.

Write a program in C to compute x to the power n using while loop. [2 x 10 = 20 marks]