

[This Question paper contains 2 printed pages.]

Sr. No. of question paper : 3571

Your roll no.....

Unique Paper code : 2224002004

Name of the Paper : Numerical Analysis and Computational Physics
(GE paper)

Name of the Course : B.Sc. (Hons.) NEP

Semester : I/III/V

Duration : 2 Hours

Maximum Marks : 60 Marks

Instruction for candidates

1. Write your Roll no. on the top immediately on receipt of this question paper.
2. Question no. 1 is compulsory.
3. Attempt any four questions.
4. Use of non-programmable scientific calculator is allowed.

Q1. Attempt any five questions

5x3=15

- a. What are the criteria used to terminate an iterative procedure?
- b. Obtain the expression of approximate root for Secant method from Newton Raphson Method.
- c. With the help of suitable examples, distinguish between truncation error and round-off error.
- d. Discuss the condition on number of intervals in Simpson's 1/3 integration method.
- e. If the slope of a function is zero at any approximate root discuss whether Newton Raphson method converges to a root or not?
- f. Given $n + 1$ data points explain what will be the order of interpolating polynomial?
- g. Suppose you are given set of (x_n, y_n) data points with y_3 has an error ϵ . Show the error propagation in Newton forward difference table for 3rd order of difference. Take total number of data points to be 6.

2 (a) With appropriate initial guesses determine the point of intersection of the curves given by $y = x^3 - 2x + 1$ and $y = x^2$ using bisection method.

b) Find by Newton's method, the root of the equation $e^x - 4x = 0$, which is approximately 2, correct to three decimals. (8+7)

3. a) Construct a backward difference table, $y = \log x$ given that

x	10	20	30	40	50
$y = \log x$	1	1.3010	1.4771	1.6021	1.6990

And find values of $\nabla^3 \log 40$ and $\nabla^4 \log 50$.

b) Derive the expression for Newtons' Forward interpolating polynomial. (7+8)

4 (a) A particle is moving along a straight line. The displacement x at some time t are given as $(t, x): (0,5); (1,8); (2,12); (3,17); (4,26)$ Find the velocity of particle at $t = 4$. When the particle will attain maximum velocity?

b) Evaluate $\int_1^2 \frac{e^x}{x} dx$ using Simpson's 1/3 rule with number of intervals $n = 4$. For what n the value of integration obtained by Trapezoidal rule is (almost) equal to the result from Simpson's 1/3 rule. (7+8)

5. a) Find the solution of following differential equation using second order Runge-Kutta method

$$\frac{dy}{dx} + 2xy^2 = 0 \quad y(0) = 1 \text{ with } h = 0.25 \text{ on interval } [0,1].$$

b) Fit the following data to a power function:

x	0	2	4	6
$y = \log x$	10	15	18	25

8+7