

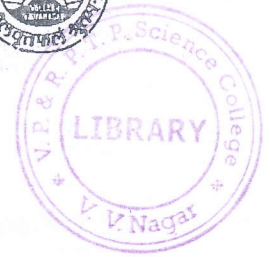


A Charutar Vidya Mandal's Institution  
**V. P. & R. P. T. P. SCIENCE COLLEGE**  
 (AUTONOMUS) (Grant-in-Aid)

Affiliated to Sardar Patel University, Vallabh Vidyanagar -388120

**Bachelor of Science (Semester 5) Internal Examination -2025**

**US05MIMTH01: Numerical Analysis-1**



Date: 24-09-2025, (Wednesday)

Time: 10:45 am to 11:45 am

Total marks: 20

NOTE: The symbols used in this paper have usual meaning unless specified.

**Q. 1 Choose the most appropriate answer from the following multiple-choice questions. [06]**

- (1) If  $f$  is continuous function having function values  $f(0) = 6$ ,  $f(1) = 4$ ,  $f(2) = 1$ ,  $f(3) = -2$  and  $f(4) = -5$  then one root of  $f(x) = 0$  lies in the interval \_\_\_\_\_.  
 (a) (0, 1). (b) (1, 2). (c) (2, 3). (d) (3, 4).
- (2) The number \_\_\_\_\_ is round off to the number 30.0567 to four significant figures.  
 (a) 30.0567 (b) 30.057 (c) 30.056 (d) 30.06
- (3) In the Newton-Raphson method, successive approximation are given by \_\_\_\_\_.  
 (a)  $x_{n+1} = x_n + \frac{f(x_n)}{f'(x_n)}$  (b)  $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$   
 (c)  $x_{n+1} = x_n - \frac{f'(x_n)}{f(x_n)}$  (d)  $x_{n+1} = x_n + \frac{f'(x_n)}{f(x_n)}$
- (4) Mean operator  $\mu$  is defined by  $\mu y_r =$  \_\_\_\_\_.  
 (a)  $\frac{1}{2} (y_{r+\frac{1}{2}} - y_{r-\frac{1}{2}})$  (b)  $\frac{1}{2} (y_{r+\frac{1}{2}} + y_{r-\frac{1}{2}})$  (c)  $y_{r+\frac{1}{2}} + y_{r-\frac{1}{2}}$  (d)  $y_{r+\frac{1}{2}} - y_{r-\frac{1}{2}}$
- (5) ~~Second~~ backward difference  $\nabla^2 y_4$  is given by  $\nabla^2 y_4 =$  \_\_\_\_\_.  
 (a)  $y_4 - y_2$  (b)  $y_6 - y_4$  (c)  $y_4 - y_3$  (d)  $y_5 - y_4$
- (6) In the Bessel's Interpolation formula, the coefficient of  $\Delta^3 y_{-1}$  is given by \_\_\_\_\_.  
 (a)  $\frac{p(p-1)(p-2)}{3!}$  (b)  $\frac{p(p-1)(p+1)}{3!}$  (c)  $\frac{p(p^2-1)(p^2-2)}{3!}$  (d)  $\frac{p(p-1)(p-\frac{1}{2})}{3!}$

**Q. 2 (A) Define absolute, relative and percentage errors and give general error formula for  $u = f(x, y, z)$ . [02]**

(B) Use method of false position to find a root of the equation  $x^3 - 2x - 5 = 0$ . [05]

OR

**Q. 2 (P) Discuss the Bisection method to find an approximate root of continuous function. [05]**

(Q) Obtain the root of  $x = \phi(x)$  using Aitken's  $\Delta^2$  process by taking  $x_1 = 1.5$ ,  $x_2 = 1.535$  and  $x_3 = 1.518$  [02]

**Q. 3 (A) Derive Newton's backward difference interpolation formula for equally spaced values of argument. [05]**

(B) write Stirling's interpolation formula and Everett's interpolation formula. [02]

OR

Q. 3 (A) Prove that  $\mu = \sqrt{1 + \frac{1}{4}\delta^2}$ .

[02]

(B) By using Gauss' forward formula, find  $e^{1.17}$  for the given data

[05]

|        |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|--------|
| x      | 1.00   | 1.05   | 1.10   | 1.15   | 1.20   | 1.25   | 1.30   |
| exp(x) | 2.7183 | 2.8577 | 3.0042 | 3.1582 | 3.3201 | 3.4903 | 3.6693 |

*All The Best*