

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**M.Tech. Winter 2018 - 19 Examination**

Semester: 1

Subject Code: 203209133

Date: 13/12/2018

Time: 10:30am to 1:00pm

Subject Name: Analytical and Numerical Methods for Structural Engineering Total Marks: 60

**Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1** A) Write the properties of Eigen values. (05)

B) Find the absolute error and relative error in  $\sqrt{6} + \sqrt{7} + \sqrt{8}$  correct to 4 significant digits. (05)

C) Explain the errors encountered in any numerical computations in brief. (05)

**Q.2** Answer the following questions. (Attempt any three) (15)

A) Explain  $\int_0^6 \frac{dx}{1+x^2}$  by using

- (i) Trapezoidal rule
- (ii) Simpson's 3/8 rule

B) Explain rate of convergence.

C) Evaluate the following by Newton iteration method:

- (i)  $\sqrt{5}$     (ii)  $1/31$

D) Explain the geometrical interpretation of Newton-Raphson method.

**Q.3** A) Find the root of the equation  $\cos x = x e^x$  using the Regula –Falsi method correct to four decimal places. (07)

B) Apply Gauss-Jordan method to solve the equations (08)

$$x + y + z = 9$$

$$2x - 3y + 4z = 13$$

$$3x + 4y + 5z = 40$$

**OR**

B) Using Jacobi's method, find all the eigen values and the eigen vectors of the matrix. (08)

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$

**Q.4** A) Find  $f'(22)$  from the Gauss forward formula: (07)

x:	20	25	30	35	40	45
f(x):	354	332	291	260	231	204

**OR**

A) Using Newton's divided differences formula, evaluate  $f(8)$  and  $f(15)$ . (07)

x:	4	5	7	10	11	13
f(x):	48	100	294	900	1210	2028

B) Find  $f'(10)$  from the following data (08)

x:	3	5	11	27	34
f(x):	-13	23	899	17315	35606