

Total No. of Questions : 4]

SEAT No. :

PA-4966

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[6008]-215

S.E. (Electrical Engineering) (Insem)

NUMERICAL METHODS AND COMPUTER PROGRAMMING

(2019 Pattern) (Semester - II) (203148)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable additional data, if necessary.
- 5) Use of a non-programmable calculator is allowed.

Q1) a) Solve the following equation using the Birge-Vieta method. [7]

$$x^3 + x^2 - 1 = 0$$

The initial approximation is $p_0 = 2$. Solve only Two iterations.

- b) Write the statement of Descartes's rule of the sign. The equation of one of the systems is given by $x^4 - 10x^3 - 120x^2 + 320x + 1024 = 0$. Apply Descartes's rule of the sign to the above characteristics equation and find the number of real positive roots, real negative roots, and complex roots in the above equation. [8]

OR

Q2) a) The two numbers a and b with absolute error ϵa_1 and ϵa_2 . Prove that

absolute error in $a * b$ is $a\epsilon a_2 + b\epsilon a_1$ and absolute error in $\frac{a}{b}$ is

$$\frac{b\epsilon a_1 - a\epsilon a_2}{b^2}. [7]$$

- b) Explain the intermediate value theorem along with its graphical representation. How the intermediate value theorem is represented mathematically?

Apply the intermediate value theorem to the following equation to find a range of positive roots : [8]

$$f(x) = \cos x - 3x + 1$$

P.T.O.

- Q3) a)** Find the real root of $xe^x - 2 = 0$ correct to three places of decimals using Newton Raphson method with the interval as 1. [7]
- b)** Evaluate the root of the equation by using the Regula Falsi method. The intervals are (2, 3). Solve only 4 iterations correct up to 4 decimal places.
 $f(x) = x^3 - 5x - 7$ [8]

OR

- Q4) a)** IF P is the pull required to lift a load W by means of a pulley block, find a linear law of the form $P = C + mW$ connecting P and W, using the following data

P	12	15	21	25
W	50	70	100	120

Where P and W are taken in kg-wt. Compute P when $W = 150$ kg. [7]

- b)** By using the bisection method find an approximate root of the equation $\sin x = \frac{1}{x}$, that lies between $x = 1$ and $x = 1.5$ (measured in radian) carry out computations up to 7th stage. [8]

