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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 εa1 and εa2. Prove that absolute error in $a * b$ is $a\varepsilon a2 + b\varepsilon a1$ and absolute error in $\frac{a}{b}$ is $\frac{b\varepsilon a1 - a\varepsilon a2}{b^2}$. **[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 7^{th} stage. **[8]**