M.C.A. 1st Year 2nd Semester Examination , 2018
Numerical Methods

Time : 3 Hours **Full Marks : 100**

Answer Q1 and any ***FOUR*** from the rest.
All questions and subparts of a question carry equal marks.

Q1. Provide very short contextual discussions on the following topics :

(a) Numerical Analysis

(b) Non-linear equations

(c) Augmented Coefficient Matrix

(d) Eigen Values and Eigen Vectors

(e) Forward Difference Operator

(f) Splines

(g) Newton Kote's formula

(h) Ordinary Differential Equations

(i) Initial Value Problem

(j) Short coming of Euler's Method

Q2. (a) Describe the Secant Method of solving Non-linear equation and compare its pros and cons with the Newton-Raphson Method.

(b) Use Newton-Raphson Method to find the root of the following equation :- $x^3 - 2x - 5 = 0$ starting at $x = 2$.

Q3. (a) Give an algorithmic representation of a Direct Method for solving Linear Simultaneous Equations.

(b) Why would you need Iterative Methods instead? Outline one such technique.

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Q4. (a) What is the utility of the Power Method ? Elaborate on its technique.

(b) Apply power method on matrix $A = \begin{matrix} 1 & 2 \\ 3 & 4 \end{matrix}$ to generate appropriate outputs.

[Assume $\varepsilon = 0.001$]

Q5. (a) In interpolation problems establish any one relationship between the Forward and Backward Difference Operators.

(b) Explain the utility and principles of the Lagrangian Interpolation technique.

Q6. Establish a general formula for solving integration problems numerically. Show how you can generate each of the following from the same :- Trapezoidal rule, Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule.

Q7. (a) How can you modify Euler's Method of solving Ordinary Differential Equations?

(b) Describe further improvements achieved utilizing Runge-Kutta Second Order and Fourth Order Formula.

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