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M.A./M.Sc. Semester II Examination, 2019 (under DDE)

Subject: Mathematics

Paper: MCG 205 (COMPUTER AIDED NUMERICAL PRACTICAL)

Time: 2 Hours Full Marks: 50

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
[Notation and symbols have their usual meaning]
[10 marks reserved for viva-voce]

Answer any **two** questions. Only **first two** answers will be evaluated. 20×2 = 40

1 Write down an appropriate FORTRAN-program along with the corresponding algorithm to compute the value of the integral $\int_1^4 \sqrt{0.1R + \frac{1}{x}}\, dx$ correct upto four decimal places using 10 equal step lengths in Romberg method, where *R* denote the last three digits of your examination roll number. The output should contain the value of the integral and all input data. [15+5]

2 Write down an appropriate FORTRAN-program along with the corresponding algorithm to solve the following boundary value problem using Finite Difference Method [15+5]

$$(x^2 + 1.3)y''(x) - \left(4x + \frac{2}{R}\right)y'(x) + 6.2\, y(x) = \frac{x}{R}, 1 \le x \le 2$$

subject to the boundary conditions $y(1) = 0.5$, $y(2) = 1.5$ taking step size $h = 0.10$, where *R* denote the last three digits of your examination roll number. The output should contain (i) step length, (ii) boundary conditions, (iii) values of $y(x)$ for different values of x correct up to six decimal places.

3 Write down an appropriate FORTRAN-program along with the corresponding algorithm to compute the Greatest Eigen Value and corresponding Eigen vector of the following matrix, correct up to six decimal places: [15+5]

$$\begin{pmatrix} 5.25 + R/200 & 2.13 & 1.25 & 2.12 \\ 2.13 & 3.17 + R/200 & 1.56 & 4.62 \\ 1.25 & 1.56 & 2.35 + R/200 & 1.03 \\ 2.32 & 4.32 & 1.03 & 3.25 + R/200 \end{pmatrix}$$

where *R* denote the last two digits of your examination roll number.

The output should contain (i) the order of the matrix, (ii) the given matrix, (iii) Greatest Eigen value, (iv) the corresponding eigen vector, (v) No. of iterations.