PG – 138

III Semester M.Sc. Degree Examination, December 2014
(Y2K11 Scheme) (RNS)
MATHEMATICS
M 302 : Numerical Analysis and Matlab/Scilab Programming – I

Time : 3 Hours Max. Marks : 60

Instructions : *i) Answer **any five full** questions choosing atleast **one** from **each** Part.*

*ii) **All** questions carry **equal** marks.*

PART – A

1. a) Using the modified Newton-Raphson method find a double real root of $4x^4 - 8x^3 + x^2 - 3x + 9 = 0$ in [1, 2]. **4**

   b) Show that Newton-Raphson method for a double real root of $f(x) = 0$ has linear convergence. **4**

   c) Using Ramanujan's method find the smallest real root of $x = e^{-x}$. **4**

2. a) Solve using Crout's method **6**

   $4x_1 + 2x_2 + 14x_3 = 14$

   $2x_1 + 17x_2 - 5x_3 = -101$

   $14x_1 - 5x_2 + 83x_3 = 155.$

   b) Using Newton-Raphson method, solve the nonlinear equations

   $x^2 - y^2 = 4$; $x^2 + y^2 = 16$ given $x_0 = y_0 = 2\sqrt{2}$. **6**

3. a) Evaluate $\int_0^1 \frac{dx}{1+x}$ by subdividing the interval [0, 1] into two equal parts and then applying the Gauss-Legendre three point formula. Estimate the error comparing with the exact value. **8**

   b) Evaluate $\int_0^1 \int_0^1 e^{x+y}\, dxdy$ using Simpson's method ($h = k = 0.5$). Estimate the error comparing with the exact value. **4**

P.T.O.

PART – B

4. a) Find the error in representing a function by a hermite interpolating polynomial when (x_i, y_i, y_i') are given. **5**

   b) Fit a cubic-spline curve that passes through (0, 1), (1, 4), (2, 0) and (3, – 2) with clamped end conditions $s'(0) = 2$ and $s'(3) = 2$. **7**

5. a) From the following table :

y \ x	0	1	2
0	1	3	7
1	3	6	11
2	7	11	17

   Obtain Lagrange bivariate interpolation and hence find f(0.5, 0.5). **6**

   b) Find the least squares approximation of second degree from the following data : **6**

x :	– 2	– 1	0	1	2
f(x) :	15	1	1	3	19

6. a) Find the approximation $R_{1,1} = \frac{a_0 + a_1 x}{1 + b_1 x}$ to the function f(x) = cos(x). Find the maximum error in [0, 1]. **6**

   b) Find the rational approximants $R_{2,3}$ for the function f(x) = sinx. **6**

PART – C

7. a) Illustrate the use of loop and conditional statement using simple examples in Matlab/scilab. **6**

   b) Explain through examples two dimensional and three dimensional graphics in Matlab/Scilab. Include title of the graph, labeling axes and one such other feature in both. **6**

8. Write Matlab/Scilab programms for the following :

   a) To find a simple real root of the equation $f(x) = \cos x - x e^x = 0$ using fixed point or Newton-Raphson methods. Prescribe a tolerance in error of 10^{-4}. Comment on which of the two iterative methods is faster. **6**

   b) To numerically integrate any definite integral of your choice by any one quadratic formula. Mention the integral used and the method used for numerical integration. **6**