CE 601 NUMERICAL METHODS

TUTORIAL – 6

Marks – 60 **Date: 13-September-2012**

The due date of responses to the tutorial questions is atleast by 9:00 am on 24-September-2012 (Monday). You can use computational programs like Matlab, Mathematica, Fortran, C, C++, etc. or any other convenient programming language (maybe even MS-Excel) to evaluate operations like additions, multiplications, matrix operations, etc.

1. For the polynomial $P_3(x) = x^3 - 9x^2 + 26x + 24$, a) calculate $P_3(2.2)$ using nested multiplication, b) obtain deflated polynomial $Q_2(x)$ using synthetic division by factoring out $(x-2.5)$ from $P_3(x)$. **[10 marks]**

2. Use the method of direct-fit polynomial for the following data set to approximate the function between time *t* and distance *x*. **[10 marks]**

Time, *t* (s)	1.0	2.0	3.0	4.0
Distance, *x* (m)	4.5	23.0	80.5	213.0

3. Use Lagrange's third degree polynomial approximation for the given data set and interpolate the function value at $x = 1.115$ using four decimal digit precision. **[10 marks]**

x	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8
f(x)	5.1600	3.6933	3.1400	3.0000	3.1067	3.3886	3.8100	4.3511

4. The following table gives the viscosity (in milli-Pascal-seconds) of sulphuric acid as a function of concentration (in grams per grams). Form the divided difference table and develop a quadratic polynomial approximation for the data. Interpolate the function to evaluate the viscosity at 0.52 concentration of sulphuric acid. **[10 marks]**

Concentration	0.0	0.20	0.40	0.60	0.80	1.00
Viscosity	0.89	1.40	2.51	5.37	17.4	24.2

5. Use Newton's forward difference method to obtain a third degree polynomial approximation to the given data set and interpolate the temperature at 6.3 MPa pressure: **[10 marks]**

*Pressure (*MPa*)*	4.0	5.0	6.0	7.0	8.0	9.0
Temperature (^{0}C*)*	250.40	263.99	275.64	285.88	295.06	303.40

6. The experimental data on partial pressure of water vapor p_A (in atm) with respect to the distance *y* (mm) from the surface of a pan of water is given below. Estimate a) the partial pressure at y = 1.5 mm and b) the distance *y*, when the partial pressure p_A = 0.026. **[10 marks]**

y (mm)	0.0	1.0	2.0	3.0	4.0	5.0
p_A (atm)	0.100	0.065	0.042	0.029	0.022	0.020