RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES, MIHINTALE

B.Sc. (General Degree) Examination

Second Year – Semester 11 Examination- March /April 2014

MAA 2203 – Numerical Analysis II

Answer **four** questions. Time allowed: **02 hours**

Calculators will be provided

1.

i. The population of a country in the decennial census were as given below. Estimate the population for the year 1895.

Year (x) :	1891	1901	1911	1921	1931
Population (y) (in thousands) :	46	66	81	93	101

ii. Let $x_0 = 0.85$, $x_1 = 0.87$, $x_2 = 0.89$. Find the interpolating polynomial of function $f(x) = e^x$ by using the Newton formula. Find a linear approximation for f(0.86).

2. Given the table of values

x	1.0	1.05	1.08	1.1
F(x)	2.72	3.29	3.66	3.90

I. Construct the best quadratic Lagrange interpolating polynomial to approximate the function $f(x) = 3xe^x - 2e^x$ at x = 1.04.

II. Compute the error bound for your approximation in part (a).

III. Use three point formula to find the approximate value of the f '(1.05). Compute an actual error and an error bound.

3.

a. Consider the points $x_0 = 1$, $x_1 = 1.5$, $x_2 = 2.5$ for a function f(x) and the divided differences are $f[x_2] = 5$, $f[x_1, x_2] = 15$, $f[x_0, x_1, x_2] = 35$. Use these information, construct the complete divided differences table for the given points.

b. Use quadratic interpolation which interpolates f(x) at points x_0, x_1 and x_2, derive a suitable numerical integration rule for approximating the integral $\int_a^b f(x)\,dx$.

c. Evaluate $\int_1^2 \frac{e^{-x}}{x}\,dx$, with h = 0.2 using suitable numerical integration formula.

4. Construct the natural cubic spline interpolant for f(x)=ln($e^x + 2$) with nodal values

x	f(x)
-1.0	0.86199480
-0.5	0.958o2009
0.0	1.0986123
0.5	1.2943767

Calculate the absolute error in using the interpolant to approximate f(0.25) and f'(0.25).

5.

a) Evaluate the integral $\int_0^{\frac{\pi}{4}} \sin 4x\,dx$ using trapezoidal rule with n = 4. Estimate the error bound and compare with the exact error.

b) Approximate the integral $\int_0^{0.5} \sqrt{1-x^2}\,dx$ using Simpson's rule with six sub-intervals.

6. Use the Hermite polynomial that agrees with the data listed in the following table to find an approximation of f(1.5)

k	x_k	$f(x_k)$	$f'(x_k)$
0	1.3	0.6200860	-0.5220232
1	1.6	0.4554022	-0.5698959
2	1.9	0.2818186	-0.5811571