NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MAY/JUNE 2012 EXAMINATION

MTH 307 NUMERICAL ANALYSIS II
TIME ALLOWED: 3 HOURS

TOTAL: 70 MARKS
INSTRUCTION: ANSWER ANY 5 QUESTIONS

1. (a) What is the degree of the polynomial involved in the equation: $(2x+1)(x^2-4)=0$ hence obtain its solution. -6 marks

(b) Use Hermite cubic interpolation to estimate the value of $\sqrt{55}$ taking $f(x)=\sqrt{x}$, $x_1=49, x_2=64$ -8 marks

2. By using the Least Squares Approximation, fit
(a) a straight line
(ii) a parabola
to the given the data below

x	1	2	3	4	5	6
y	120	90	60	70	35	11

3. (a) Distinguish between discrete data and continuous function - 4marks

(b) Find the least squares quadratic $ax^2+bx+c=0$, which best fits the curve over the interval $0\le x\le 1$ -10 marks

4. (a) Use the recurrence formula to generate the Legendre Polynomial $P_3(x)$ -5marks

(b) Evaluate $\int_1^3 \frac{1}{x+1} dx$ using the Simpson's one-third rule with $h=\frac{1}{4}$, working with four floating point arithmetic -9 marks

5. (a) Find the fourth degree least squares polynomial to |x| over [-1, 1] by means of Legendre polynomials – 7 marks

(b) Given a continuous function e^{-x} for $x \in [-1,1]$ fit a linear polynomial C_0+C_1x to e^{-x} and determine its roo t mean square error -7 marks

6. (a) Use a cosine function to establish recurrence formula for generating Chebyshev Polynomials $T_3(x)$ -6 marks

(b) Find the cubic Spline given the table

x	0	2	4	6
y	1	9	41	41

-8 marks

7. (a) Convert the first 5 terms of the Taylor series expansions for ex into Chebyshev polynomials -6 marks

(b) By using the Trapezoidal rule integrate $\sqrt{x}$ between argument 1.00 and 1.30 for the data below *x*-8 marks

x	1.0	1.05	s1.10	1.15	1.20	1.25	1.30
$\sqrt{x}$	1.00	1.0247	1.04881	1.01238	1.09544	1.11803	1.1407

Obtain the actual error