CODE:MTH 307   TIME: 3 HOURS
TITLE: NUMERICAL ANALYSIS II   TOTAL: 70 MARKS
CREDIT UNIT: 3
INSTRUCTION: ANSWER ANY 5 QUESTIONS

1. (a)   **Find the least squares quadratic** $ax^2+bx=0$ **, which best fits the curve over the interval**

   $1 \leq x \leq 2$ **8 marks**

   (b)   **Using Rodrigues' formula** $p_n(x)=\dfrac{1}{2^n n!}\dfrac{d^n}{dx^n}\left[(x^2-1)\right]$ **,where** $n=0,1,2,..$ **,**

   generate the Legendre Polynomial $P_3(x)$ **6marks**

2. (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 -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	1.14047

3. (a)   **Distinguish between discrete data and continuous function 6marks**

   (b)   **Evaluate** $\displaystyle\int_0^2 \dfrac{1}{x^2}dx$ **using the Simpson's one-third rule with** $h=\dfrac{1}{2}$ **, working with four floating point arithmetic   8 marks**

4. (a)   **What is the degree of the polynomial involved in the equation:** $(2x+1)(x-4)=0$

   hence obtain its solution. -6 marks

(b)   Use Hermite cubic interpolation to estimate the value of $\sqrt{56}$

taking $f(x)=\sqrt{x}$,
$$x_1=47, x_2=63$$
-8 marks

5. (a)   Find the second degree least squares polynomial to [____] over [0, 1] by means of Legendre
polynomials – 7 marks

(b)   Given a continuous function e^{-x} for $x \in [-1,1]$ fit a linear
polynomial $C_0 + C_1 x$ 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 $T_2(x)$ -6 marks

(b)   Find the cubic Spline given the table

x	0	2	4	6
y	1	9	41	41

8 marks

7. By using the Least Squares Approximation, fit

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

(a) a straight line   **6 marks**

(b)   a parabola to the given the data above 8 marks