NATIONAL OPEN UNIVERSITY OF NIGERIA
Plot 91, Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja

FACULTY OF SCIENCES
DEPARTMENT OF MATHEMATICS
2023_2 EXAMINATIONS

Course Code: MTH 307
Course Title: Numerical Analysis II
Credit Unit: 3
Time Allowed: 3 Hours
Instruction: Answer Question Number One and Any Other Four Questions

1a. Define Polynomial and Polynomial equation. **(3 marks)**

b. What is the degree of the polynomial involved in these equations:
i. $(5x^2 + 4)(x - 9)$ ii. $(3x^5 + 7x)(1/x + x)$ **(4 marks)**

c. Find the Cubic approximation to e^x by using Chebyshev polynomial. **(8 marks)**

d. Calculate a linear least square approximation to f(x), if $f(x) = e^x$ on interval [-1, 1].

(7 marks)

2a. Define $P_n(x)$ by RODRIGUE'S formula and state the three properties of $P_n(x)$. **(4 marks)**

b. Prove the orthogonality of Chebyshev polynomial with respect to weight function $w(x) = (1 - x^2)^{-\frac{1}{2}}$ where

$$\int_{x_0=-1}^{x_1=1} T_n(x)T_m(x)w(x)dx = \begin{cases} 0, & m \neq n \\ \frac{\pi}{2}, & m = n \neq 0 \\ \pi, & m = n = 0 \end{cases}$$ **(8 marks)**

3a. If f(x) be a continuous function for $a \leq x \leq b$, then c[a, b] the set of all continuous real valued function in the interval [a, b], State the infinite or Chebyshev norm and its properties.

(5 marks)

b. Construct the cubic Spline Interpolant to f(x) = x with knots -1 0 1 subject to clamped boundary conditions. **(7 marks)**