NATIONAL OPEN UNIVERSITY OF NIGERIA

Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi, Abuja.

FACULTY OF SCIENCES

April /May Examination 2019

Course Code: MTH307
Course Title: Numerical Analysis11
Credit Unit: 3
Time Allowed: 3 HOURS
Total: 70 Marks
Instruction: ATTEMPT QUESTION ONE (1) AND ANY OTHER FOUR (4) QUESTIONS

1. (a) Distinguish between polynomial as a function and a polynomial equation (4 marks)

   (b) Differentiate between **IVP** and **BVP** and give example in each case (6 marks)

   (c) Define the following; (i) Orthogonal Polynomials (2 marks)

   (ii) Degree of a Polynomials (2 marks)

   (iii) Chebyshev Polynomial (2 marks)

   (iv) Cubic Spline (3 marks)

   (d) State the necessary formula for generating Legendre Polynomials (3 marks)

2. Given a continuous function e^x for $x \in [-1,\ 1]$ fit a linear polynomial
   $C_0 + C_1 x \quad to\ e^x$ and determine its root mean square error (12 marks)

3. (a) Explain and give two examples of Ordinary Differential Equation (4 marks)
   (b) Find the fourth degree least squares polynomial to $|x|$ over $|-1, 1|$
   by means   of Legendre Polynomials (8 marks)

4. (a) Evaluate, mention the number of non-zero coefficients
   as well as the degree of $(2x + 5)(x^2 - 1)$ (5 marks)
   (b) Find the least square quadratic $ax^2 + bx + c,$ which best fits the curve
   $y = \sqrt{x}$ over the interval $0 \le x \le 1$ (7 marks)

5. (a) Define PDE and give two examples of PDE (4 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)

6. (a) Given a function $f(x)$, write a polynomial of degree 5 (3 marks)

    (b) Find the cubic Spline given the table below;

x	0	2	4	6
y	1	9	41	41

      where $M_0 = 0$, $M_3 = -12$ (9 marks)