NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, Plot 91, Cadastral Zone, Nnamdi Azikwe Express Way, Jabi-Abuja

FACULTY OF SCIENCES
November, 2018 Examinations

Course Code: **MTH307**
Course Title: **Numerical Analysis**
Credit Unit: **3**
Time Allowed: **3 Hours**
Total: **70 Marks**
Instruction: **Answer Question One and Any Other 4 Questions**

1 . Evaluate $\int_0^3 \frac{1}{1+x^5}\,dx$ with step-length $\frac{1}{2}$ correct to 5 decimal places using

i. Trapezoidal rule 11 marks

ii. Simpson's $\frac{1}{3}$-rule. **11 marks**

2 a. Write out the orthogonality relation and the symmetric property of the Chebyshev polynomial.

7marks

b. Show that $2\left(T_n(x)\right)^2 = T_{2n}(x)+1$; where $T_n(x)$ is Chebyshev polynomial. **5marks**

3. Solve the BVP $(1+x^2)y'' + 2xy - y = x^2$; y (0) = 1 and y (1) = 0 using a step length of 0.25

12 marks

4. Use Hermite cubic interpretation to estimate the value of $\sqrt{55}$ taking

$f(x) = \sqrt{x},\ x_1 = 4,\ x_2 = 16$ **12 marks**

5. Use the least squares to fit a parabola to the data given below correct to 2 decimal places

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

12marks

6. a. State two (2) properties of spline function S(x) of degree k with n nodes, $x_1 < x_2 < \cdots < x_n$

2marks

b. Distinguish between IVP and BVP and illustrate with one example each **4marks**

c. Enumerate and explain the three (3) types of boundary conditions for partial differential equations **6 marks**