SOUTHWESTERN UNIVERSITY NIGERIA

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FACULTY OF PURE & APPLIED SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

HND TO BSC CONVERSION PROGRAMME

2018/2019 FOURTH SEMESTER EXAMINATION

COURSE CODE: MAT 427 COURSE TITLE: Numerical Analysis

Instruction: Answer question one and any other two question. **TIME:** 2½ hrs

1. (a) Write an algorithm to find a solution to $f(x) = 0$ given an initial approximation $P0$ for the Newton-Raphsons method.

(b) Let $f(x) = \frac{1}{2} + \frac{1}{4}x^2 - x\sin x - \frac{1}{2}\cos 2x$, $P0 = \frac{1}{2}$. Iterate using Newtons method until an accuracy of 10^{-5} is obtained. Explain why the result seems unusual for Newtons method.

Also, solve the equation with $P0 = 5\pi$ and $P0 = 10\pi$. Hence, establish any comparison in these approximations based on the choice of each initial guess.

2. (a) Given a system of a n x n linear equation of the form

$$a_{11}x_1 + a_{12}x_2 + ... + a_{1n}x_\pi = b_1$$

$$a_{21}x_1 + a_{22}x_2 + ... a_{2n}x_\pi = b_2$$

$$a_{n1}x_1 + a_{n2}x_2 + ... + a_{nn}x_n = b_n$$

Transform the above systm of equation into the form $AX = B$ and state any (3) direct methods for solving it.

(b) Use the Gauss-Seidel iteration method to solve $20x_1 + x_2 - 2x_3 = 17$; $3x_1 + 20x_2 - x_3 = 18$; $2x_1 - 3x_2 + 20x_3 = 25$

Compare the rate of convergence of this method with that obtained by Jacobis iterative method.

3. (a) Determine $f(x)$ as a polynomial in x for the following data:

x:	4	1	0	2	5
$f(x)$:	1245	33	5	9	1355

(b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$

(i) Trapezoidal rule

(ii) Simpsons rule

Hence, compare and state which of the methods gives better approximation.

4. (a) Apply the Runge-Kuttas method to the differential equation $y' = x + y$, $y(0) = 1$

Take $h = 0.1$ and $h = 0.2$ respectively. Which of these step size (h) gives better accuracy in the computation of the given initial value problem?

(b) Explain the advantage of the Runge-Kuttas method over Eulers method.

5. (a) Obtain an approximate solution of the following boundary value problems (*BVP*)

$$(1 + x^2)y'' + 2xy' = x^2$$