FEDERAL UNIVERSSITY OF TECHNOLOGY, OWERRI
SCHOOL OF HEALTH TECHNOLOGY
DEPARTMENT OF BIOMEDICAL TECHNOLOGY
2012/2013 RAIN SEMESTER EXAMINATION

COURSE: BIOMEDICAL SYSTEM ANALYSIS **COURSE CODE: BMT 302**

Instruction: Instruction: Answer any four questions **Time: 2:00 hours; Unit:2**

1(a) What do you understand by biomedical system analysis

(b) Distinguish between modeling and analysis

(c) Solve this non-linear biomedical mode: $f(x) = x^3 - 7x + 2$. For the interval of $0 \leq x \leq 1$ with $\varepsilon < 0.01$.Using the following numerical methods: (i) Newton's method (ii) Regular-Falsi method. Hence state with reason(s) the best method.

(Total: 20marks)

2(a) State steps involves in solving Second order ordinary differential equation using:

(i) Euler-Cauchy method and (ii) Runge-Kutta method.

(b) State two advantages and one disadvantage for using each of the following in simulating biomedical system over on another:

(i) Euler's method.

(ii) Runge-Kutta method.

(Total: 20marks)

3(a) State four (4) finite difference schemes with their model and application regards to ODE.

(b) Solve (i) $y' = \frac{x^2}{2} - 2y$ Using forward difference scheme.

Given that: $x(0) = 0\ and y(0) = 1.0\ for range of x = 0(0.4)2.0.$

(Total: 20marks)

4(a) What do you understand by simulation

(b) State six (6) sources of mathematical models employed in biomedical field

(c) Solve the biomedical models:

$$x + y - 5z = 3$$
$$8x - y - z = 1$$
$$x + 5y - z/2 = 2$$

Using Gaus-seidel method.

(d) From your experience, state which of these numerical techniques: (i) Jacobi method (ii) Gaus-seidel method is the best method with reason(s) and for which kind of model can be used to solve.

(Total: 20marks)

5(a) State six (6) analytical tools for simulation of biomedical models.

(b) State (i) Secant model

(ii) Bisection model for simulation of non-linear model.

(c) Solve non-linear biomedical model below

$$x^2 + y^2 = -5\frac{1}{4}$$
$$xy - xz = 0$$
$$xz + y^2 - 4z = -1/2$$

Using Newton-Raphson approach with initial values (1, 1, 1) for iteration.

(Total: 20marks)

6(a) State steps involves in solving **first order ordinary differential equation** using:

(i) Euler's method and (ii) Euler-Cauchy method.

(b) Solve $y' = x^2 - 4y$ using **Runge-Kutta method**.

(Total: 20marks)