FEDERAL UNIVERSITY OF TECHNOLOGY
SCHOOL OF ENVIRONMENTAL TECHNOLOGY
DEPARTMENT OF SURVEYING & GEOINFORMATICS
FIRST SMESTER EXAMINATION 2017/2018 SESSION

COURSE TITLE: Geodetic Surveying II **COURSE CODE:** SVG515 **CREDIT UNIT:** 2 **TIME** 2.30Mins.

INSTRUCTION: Answer Question **ONE (1)** and any other **THREE (3)**

Q1. (a). What is the significant of coordinate transformation? Identify the two most commonly used methods for coordinate transformation/conversion. (10 marks)

ii). Identify the following equations and define the parameters therein: $\rho = \frac{a(1-e^2)}{(1-e^2 sin^2\phi)^{3/2}}$ *and* $\nu = \frac{a}{(1-e^2 sin^2\phi)^{1/2}}$ what is the significant of the equations in geodetic determinations? (5 marks)

(b). Give a brief account on the following: (i). Geodetic latitude (ii). Geocentric latitude (iii). Reduced latitude (iv). Geodesic and (v). Normal Section. (15 marks)

Q2. Given the following expressions for transforming Cartesian to geodetic coordinate system:

$$\lambda = \tan^{-1}\left(Y/X\right) \qquad \tan\phi = \frac{Z}{P\left(1-e^2\frac{N}{N+h}\right)}, \quad N = \frac{a}{1-e^2\sin^2\phi}, \quad h = \frac{P}{\cos\phi} - N \quad where\ P = (N+h)\cos\phi$$

Identify the type of transformation formula represented by the above equations. How can ϕ, N and h be determined by this approach? Show relevance equations. (15 marks)

(b). What are the features of the Earth Centre Earth Fixed (ECEF) Cartesian system? Name the two main ECEF reference frames commonly used today and state their key difference. (15 marks)

Q3. What do you understand by the term ellipse? Identify the basic parameters for defining the geometry of an ellipsoid and provide the equations relating them. (15 marks)

(b). In solving direct or inverse geodetic problem, what is the maximum distance that suits the use of Puissant's formulae? Why is a Gauss-mid latitude formula the most preferred method? Provide the steps for direct and inverse problems using Gauss-mid latitude formula (15 marks)

Q4. Provide the relationship between polar and rectangular coordinate systems and give the expression for transforming geodetic coordinate to Cartesian coordinate system. (10 marks)

(b). You are given a set of geodetic coordinate of a point on a datum whose geometry is defined by a semi-major axis, a = 6378137.0m and inverse flattening, 1/f = 298.2572235. If the coordinate of the said point is ϕ=09o 15' 30'', λ = 06o 20' 15'' and h=235.630m compute the coordinate of the point in a Cartesian system. (20 marks)

(b). What are the parameters that define a coordinate system and why do you need coordinate system? (10 marks)