FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND SCIENCE EDUCATION
DEPARTMENT OF GEOGRAPHY

FIRST SEMESTER 2011/2012 SESSION UNDERGRADUATE EXAMINATION

COURSE CODE: MET 515 (3 Units)
COURSE TITLE: Numerical Models in Weather Prediction
INSTRUCTIONS: Answer any 4 questions

TIME ALLOWED: 2½ Hours

1. (a) Given that

$$\nabla = \partial/\partial x \mathbf{i} + \partial/\partial y \mathbf{j} + \partial/\partial z \mathbf{k}; \quad and \quad \mathbf{V} = u\mathbf{i} + v\mathbf{j} + w\mathbf{k}$$

Simplify the following equation for a thin layer of the atmosphere where vertical motions are neglected

$$\zeta_{rel} = \nabla \times \mathbf{V}$$

(b) Explain the latitudinal region to which ζ_{rel} is mostly used for weather forecasting and why it is peculiar for the region.

2. Explain the Kinematic Vorticity 4-point lattice graphical computation method for the forecasting of weather.

3. Explain the steps necessary for the computation of Geostropic Vorticity (ζ_g) and state the latitudinal regions to which it is mostly applied and why it used for the region.

4. Discuss the Duct and Bridge conditions in the Obasi Model for East Africa, and explain how they used for weather forecast in the region.

5. Explain the Baroclinic Model and how its graphical feature is used in weather forecasting.

6. Discuss how the difference between broad flow and that in a perturbation could be used to categorise wave systems passing over West Africa, giving their dimensional characteristics.