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

Second Semester Examination 2011/2012 Session

Course: MET 522 (Advanced Topics in Atmospheric Dynamics)
Instructions: Answer any **Four** questions. The use of relevant diagrams, illustrations and equations will be rewarded. **Time allowed:** 2hrs 30 minutes

1. Discuss four of the forces responsible for motions in the atmosphere.
2. (a) Explain the following (i) Geopotential (ii) Potential temperature (iii) Hydrostatic balance (iv) Lapse rate

   (b) Derive an expression for the potential temperature of an air parcel in terms of its pressure and temperature.
3. (a) The atmosphere could be divided into layers (strata) based on the temperature difference. What is the relevance of this stratification to the study of atmospheric dynamics?
4. Explain the following:
   (i) Rain areas tend to be associated with convergence in the lower troposphere and divergence in the upper troposphere
   (ii) When the sun heats the ground wetted by rain, wisps of cloudy air sometimes form above the layer close to the ground
   (iii) Towering cumulus clouds containing large amounts of super cooled water can sometimes be induced to grow higher levels by seeding them with artificial ice nuclei.
   (iv) A parcel of air cools when it is lifted.
5. Discuss the steps required in weather forecasting and the problems associated with it in the tropics
6. (b) (i) State the hydrostatic equation and explain each term in the equation.

   (ii) Suppose at the surface, a 1000 m thick layer of air (under standard conditions) has an average density of $1.1 kgm^{3}$ and an acceleration of gravity $9.8 ms^{-2}$. Compute the rate of change of pressure with height.

Best of luck