

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF NATURAL AND APPLIED SCIENCES
DEPARTMENT OF GEOGRAPHY

Second Semester Examination 2013/2014 Session

Course: MET 522 (Advanced Topics in Atmospheric Dynamics) 3 Units

Instructions: Answer any FOUR questions. The use of relevant diagrams, illustrations and equations will be rewarded.

Time Allowed: 3 hours

1. (a) Explain briefly the thermal stratification of the atmosphere
(b) Discuss the conditions that makes weather form in the troposphere.
2. (a) Define (i) Geopotential (ii) Potential temperature
(b) Derive an expression for the potential temperature of an air parcel in terms of its pressure (P), temperature (T) and the standard pressure (P_0)
3. Explain briefly the following:
 - (i) A parcel of air cools when it is lifted.
 - (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 cloud containing large amounts of super cooled water can sometimes be induced to grow higher levels by seeding them with artificial ice nuclei.
 - (iv) Rain areas tend to be associated with convergence in the lower troposphere and divergence in the upper troposphere.
4. (a) Discuss the various forces responsible for the dynamics of the atmosphere
(b) Write an expression for an atmosphere in hydrostatic balance.
5. Write short notes on each of the following:
 - (i) Dry Adiabatic Lapse Rate
 - (ii) Saturated Adiabatic Lapse Rate
 - (iii) Diurnal variation of Atmospheric Stability
 - (iv) Conditional Instability of the Second Kind (CISK)
6. (a) State the steps required in weather forecasting.
(b) Discuss the problems associated with weather forecasting in the tropics