

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

SCHOOL OF PHYSICAL SCIENCES

DEPARTMENT OF GEOGRAPHY

SECOND SEMESTER 2015/2016 SESSION UNDERGRADUATE EXAMINATION

COURSE CODE: MET320

COURSE TITLE: Atmospheric Circulation II (3units)

INSTRUCTION: Answer **any four** Questions (Credits will be given for proper usage of relevant illustrations and diagrams)

TIME ALLOWED: 2hrs

1.
 - a. When is the atmosphere said to be in a hydrostatic equilibrium?
 - b. Derive the hydrostatic equation.
 - c. Suppose at the surface a 1000m thick layer of air (under standard conditions) has an average density of 1.1kgm^{-3} and an acceleration due of gravity 9.8ms^{-2} . Use the hydrostatic equation to compute the difference in pressure.
2.
 - a. Discuss the relevance of the equation of state in the study of atmospheric thermodynamics.
 - b. Using the basic laws of thermodynamics, derive an expression for the potential temperature of air in terms of its pressure P, Temperature T, and standard pressure P_0 .
 - c. What is the name giving to the equation in (b) above.
3.
 - a. What do you understand by term **Kinematic**?
 - b. Enumerate and explain varieties of quantities associated with motion of objects?
4.
 - a. State the four equations of motion.
 - b. Use the equation in (a) above to solve the following problems:
 - i. A car moves from rest with a uniform acceleration of 0.2m/s^2 . Find its velocity when it is moved a distance of 50m.
 - ii. A train slows from 108km/hr with a uniform retardation of 5m/s^2 , how long will it take to reach 18km/hr, and what is the distance covered/
5. Discuss the possible ways by which the atmosphere can transport heat and momentum.
6.
 - a. Explain any two of the following:
 - i. Surface wind
 - ii. Geopotential
 - iii. Potential balance
 - b. A parcel of air is being lifted from the surface (1000mb) to a height of 2km. If the density of air is 0.9kgm^{-3} and acceleration due to free fall is 9.8ms^{-2} , compute the pressure at the 2km height. State the assumptions used in achieving this.