**DEPARTMENT OF GEOGRAPHY**
**SCHOOL OF SCIENCE AND SCIENCE EDUCATION**
**FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA**
**SECOND SEMESTER EXAMINATION 2009/2010 SESSION.**

COURSE TITLE: ADVANCED TOPICS IN ATMOSPHERIC DYNAMICS (MET 522)

**Instructions:** Answer question **1** and any other **3** (**FOUR Questions in all**). The use relevant illustrations and diagrams are essential where necessary.

Time Allowed: 3hrs.

1. Analyse the chart supplied and use the analysis to solve the questions that follows..
   (a) On the chart, mark where regions of convergence and divergence are occurring.
   (b) Put an L on the chart where you might expect to observe a developing mid-latitude cyclone.
   (c) Put an H on the chart where you might expect to observe to a surface anticyclone.
   (d) In which directions would the surface cyclone and anticyclone most likely move?
   (e) In terms of convergence and divergence, what are the necessary conditions for the intensification of the surface mid-latitude storm for the building of the anticyclone?
   (f) Based on absolute vorticity, circle on the chart where you would expect to find upper-level divergence, surface convergence and a developing mid-latitude cyclone.
   (24mks)

2. Discuss in detail the scope of atmospheric dynamics and highlight its importance in the prediction of weather in the tropics.(12mks)

3. (a) Write a short note on each of the following
   (i)     Pressure gradient force
   (ii)    Coriolis force
   (iii)   Cyclostrophic forces
   (iv)    Gradient wind (8mks)
   (b) In a region 50km out from the centre of an intense hurricane, a radial pressure gradient of 50mb per 100km is observed. The storm is located at 200N. Calculate the geostrophic and pressure gradient wind speeds. (4mks)

4. Large scale atmospheric motions are governed by some basic systems of equations which are synthesized from some basic laws. Explain the basic equations and the laws from which they are synthesise.(12mks)

5. (a) Distinguish between Absolute and Relative vorticity.(4mks)
   (a) Figure 3.0 shows the area of a large cumulonimbus anvil (as observed by a geosynchronous satellite) to increase by 20% over a 10minutes period. Assuming that this increase in area is a representative of the average divergence within the 300-100mb layer, and that the vertical velocity at 100mb is zero, calculate the vertical velocity at the 300mb level.