

THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. DEGREE PROGRAMME 2010/2011

OPEN BOOK TEST

PHU 3145 / PHE 5145- ATMOSPHERIC PHYSICS

DURATION: ONE & HALF HOURS  $(1 \frac{1}{2} \text{HR})$



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DATE: 18.09.2010

TIME: 4.00pm – 5.30pm

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ANSWER ALL QUESTIONS.

01. (a) Starting from the first principles derive Hypsometric equation. State all assumptions made and identify all symbols used.
- (b) Define geopotential height ( $Z$ ).
- (c) The geopotential height ( $Z_1 - Z_2$ ) between any two levels in the atmosphere is called the thickness of the intervening layer. Show that the thickness of the layer between any two pressure levels  $p_1$  and  $p_2$  is proportional to the mean virtual temperature of the layer. Explain what happens to the thickness of the layer with the variation of the virtual temperature.
- (d) Calculate the thickness of the layer between the 1000 and 500 mb pressure surfaces at a point in the tropics where the mean virtual temperature of the layer is  $9^\circ \text{C}$ .
02. Give scientific reasoning for the following.
- (i) A parcel of air cools when it is lifted. Dry parcels cool more rapidly than moist parcels.
- (ii) Atmospheric pressure always decreases with height, whereas temperature is not.
- (iii) Clouds develop only up to tropopause.
- (iv) Dry adiabatic lapse rate is greater than moist adiabatic lapse rate.
- (v) In cold climates the air indoors tends to be extremely dry.
03. (a) What is the meaning of “lapse rate” in atmospheric physics.
- (b) Derive expressions for
- (i) dry adiabatic lapse rate
- (ii) moist adiabatic lapse rate
- (c) Describe how the above two could be used to explain the behavior of the atmosphere.