



RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

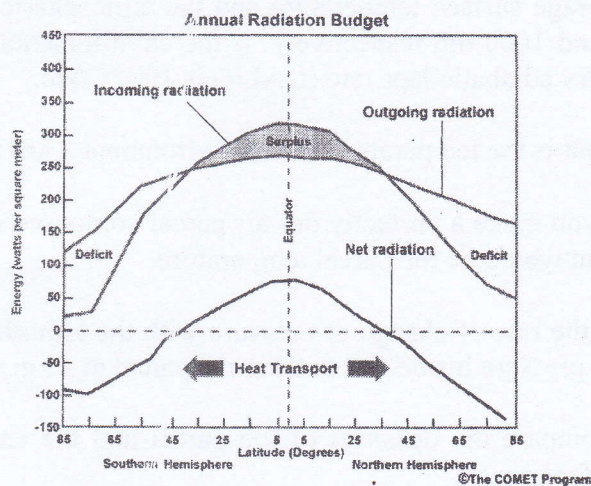
B.Sc. (General) Degree in Applied Sciences
Third Year - Semester II Examination – October / November 2017

PHY 3302 – APPLIED METEOROLOGY

Time: Three hours

Answer all questions

- (1) (a) i. Tropics are mainly defined by the land and ocean areas between the tropic of Cancer and tropic of Capricorn. What are the other factors that define the tropics? [10 marks]
- ii. The graph of annual radiation budget of a tropical region is given in the Figure below. Discuss briefly the graph justifying the reasons for it to be of tropics.



[10 marks]

- (b) In order to maintain the energy balance in the earth-atmosphere system and within latitudinal zones, energy is transported by the ocean and the atmosphere. Using a schematic diagram, explain the atmospheric and oceanic dynamics in this process separately. [12 marks]

Contd.

(c) i. Explain Madden-Julian Oscillation (MJO) and El – nino Southern Oscillation (ENSO). [10 marks]

ii. Discuss the suitability of MJO and ENSO on intraseasonal variability of rainfall and the interannual rainfall in tropics. [08 marks]

(2) Earths atmosphere consists of several layers with different compositions.

i. Name all the layers in earths atmosphere. [10 marks]

ii. Plot the variation of temperature with the height of the atmosphere. [10 marks]

iii. Giving appropriate reasons explain the variation of temperature in the lowest layer of the atmosphere. [10 marks]

iv. Explain the role of Ozone in earths atmosphere. [10 marks]

v. Earths early atmosphere was mainly consisted of Hydrogen (H_2) and Helium (He) gases. But in present day atmosphere the amount of H_2 and He gases are very low. (H_2 – 0.5 PPM and He – 5.24 PPM) Explain. [10 marks]

(3) The average surface temperature and the atmospheric pressure of Mihintale area is $300^\circ C$ and 1000 mb respectively. If the environmental laps rate (ELR) is $70^\circ C/km$ and the dry adiabatic laps rate (DALR) is $100^\circ C/km$,

i. What is the temperature of the environment 2 km above the surface? [10 marks]

ii. If you make a perfectly dry air parcel composed of surface air, and lift it 2 km, what would be the parcel temperature. [10 marks]

iii. If the rate of change of pressure with the altitude is 100 mb/km, then compare the pressure inside and outside the parcel at 2 km above the surface. [10 marks]

iv. Compare the densities of the parcel and the environment at 2 km above the surface. [10 marks]

v. Giving specific reasons comment on the stability of the above atmosphere. [10 marks]

Contd.

(4) Hydrostatic equation helps to understand the pressure variation across the atmosphere.

(a) i. Write down the Hydrostatic equation [05 marks]

ii. Starting with Hydrostatic equation derive an equation for the pressure variation of the atmosphere with the height of the atmosphere. [10 marks]

iii. Plot the atmospheric pressure as a function of height. [05 marks]

(b) i. Briefly explain the mechanism behind the cloud formation. [10 marks]

ii. Explain why all the clouds cannot produce precipitation. [10 marks]

iii. A cyclone close to Japan rotates anti clockwise while cyclone close to South Africa rotates in clockwise direction. Using appropriate figures explain the reason for the above difference. [10 marks]

(5) (a) Substantiate the following statements.

i. Cloud seeding has been shown to be effective in converting **supercooled liquid water** to ice particles. [12 marks]

ii. Silver iodide (AgI) which possesses a **hexagonal crystal structure** is an ideal candidate for ice nucleation process. [12 marks]

iii. In **warm cloud seeding**, hygroscopic materials such as NaCl and urea are used in place of AgI. [12 marks]

(b) Explain in detail how hurricane modification is done by cloud seeding method. Use diagrams where appropriate. [14 marks]

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