2017

M.Sc.

3rd Semester Examination

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

PAPER—MTM-306(OM)

Full Marks : 50

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Dynamical Meteorology-I)

Answer *Q. No. 8* and any *four* questions from the rest.

1. (a) Define homogeneous atmosphere. Show that the height of the homogeneous atmosphere depends entirely on the temperature at the bottom. Also prove

that the pressure at the top of the homogeneous isothermal atmosphere is equal to $1/e$ times that at the sea level. 7

(b) What is the purpose of aerological diagram ? Give the criteria of this diagram. 2

2. (a) Discuss stability analysis of an air parcell in the atmosphere by Parcel Method. 7

(b) Show that the potential temperature of an air parcel is invariant. 2

3. (a) Derive the equation of horizontal motion of an air parcel in natural co-ordinate system. 7

(b) Find a relation between mixing ratio and specify humidity. 2

4. (a) Derive a relation from which the saturation temperature can be obtained when the saturation of the unsaturated moist air will be done by adiabatic ascent. Hence estimate the height at which saturation is reached. 7

(b) Explain the equivalent potential temperature in the atmosphere. 2

5. (a) How is the thermal wind formed in the atmosphere ? Derive the thermal wind components in the atmosphere. 7

(b) What is the concept of available potential energy ? 2

6. (a) Obtain the atmosphere energy equation and interpret each term. 7

(b) What do you mean by equivalent temperature ? 2

7. (a) Deduce the equation of state for moist air in the following form

$$p\alpha = \frac{R^*}{m_d}\left(\frac{1+\frac{w}{\varepsilon}}{1+w}\right)T$$ 5

(b) Derive the adiabatic lapse rate of unsaturated moist air. 4

8. Answer any *two* questions : 2×2

(a) Define Dew Point Temperature. 2

(b) Prove that $T_v = T(1+0.61r)$ where T_v be the virtual temperature, T be the dry bulb tempreature and r be the mixing ratio of an air parcel. 2

(c) Derive the origin of pressure change in the atmosphere. 2

[Internal Assessment—10 Marks]

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