

4-4-2016



School of Environment & Natural Resources (SENR)

Mid-Semester 2016

M.Tech. IInd Sem

ETC - 597 : Environmental System Analysis and Modelling

Max Marks : 30

Time : 2 hours

Section A : One Mark Questions : Questions 1-5, choose one among four options, only one is correct. For questions 6-10, answer in not more than 20 words.

1. The pressure decreases with height
(a) exponentially
(b) linearly
(c) sinusoidally
(d) None of the above
2. Dry adiabatic lapse rate is the moist adiabatic lapse rate
(a) higher than
(b) lower than
(c) equal to
(d) not comparable to
3. Coriolis force is zero and maximum at
(a) equator and pole,
(b) pole and equator,
(c) equator and tropic of cancer,
(d) equator and tropic of Capricorn, respectively.
4. Which of the following wind is the result of balance between pressure gradient and Coriolis force.
(A) Geostrophic wind
(B) Polar Wind
(C) westerlies
(D) Trade Winds
5. In which layer do virtually all weather phenomena take place?
(A) Mesosphere.
(B) Stratosphere.
(C) Thermosphere.
(D) Troposphere.
6. In tropical region, an aircraft is flying at an altitude of 10 km. At that altitude the temperature is -40°C . What is the ambient temperature on the ground ?
7. When does the virtual temperature become equivalent to normal temperature in the atmosphere?
8. What is the relation between potential temperature and atmospheric stability?
9. Cyclone/anticyclone conditions are the result of balance among three forces. Which are those?
10. What is the difference between Lagrangian model and Eulerian model?

Section B : Answer any FOUR of the following:

(5 Marks each)

11. What is dry adiabatic lapse rate? Derive an expression for dry adiabatic lapse rate and show that it is $9.76^{\circ}\text{C}/\text{km}$. ($g = 9.8 \text{ ms}^{-2}$, $C_p = 1006 \text{ Jkg}^{-1}\text{degC}^{-1}$).
12. Which are the fundamental forces governing the dynamics of the atmosphere? Derive an expression for the pressure gradient force.
13. What is Coriolis force? Derive and explain the latitudinal dependence of Coriolis force when air parcel moves along longitude.

Or

What is Coriolis force? Explain its effect and direction under the conditions : when air parcel (i) is moved along longitude, (ii) moves vertically, (iii) is moving eastward/westward along latitude. Which component of Coriolis force is negligible?

14. What is boundary layer height? How is the boundary layer formed? Explain different layers of boundary layer. Which are the dominant forces in boundary layer worth to be considered?
15. What is equation of state for an ideal gas? How does it get modified in the presence of water vapour? Explain virtual temperature in this context.
16. What is continuity equation of air? Which conservation law does it refer to? Air is called "compressible" and "inhomogeneous", explain.