

Note: All answers are to be written on the answer sheet only. Nothing should be written on the question paper.

Q1. Answer the following

[1x10=10]

- (i) In the atmosphere, which one of these significantly changes with time and space
 (a) Nitrogen (b) Oxygen (c) Water Vapour (d) none of these
- (ii) Which one of these is responsible for generating atmospheric processes
 (a) Change in temperature (b) Change in pressure
 (c) Change in relative humidity (d) None of these
- (iii) Motion in the atmosphere is horizontal because:
 (a) Large Depth/Small Width (b) Large Width/Small Depth
 (c) Equal Depth and Width (d) None of these
- (iv) Coriolis force is a function of
 (a) Temperature of body (b) Pressure on body (c) Velocity of body
 (d) Mass of body
- (v) The boundary layer from sunset to sunrise is known as
 (a) Convective (b) Nocturnal (c) Stable (d) Mixed
- (vi) The buoyant turbulence dominates shear turbulence in
 (a) NBL (b) CBL (c) SBL (d) MBL
- (vii) The planetary surface characteristics directly influence
 (a) CBL (b) NBL (c) MBL (d) SBL
- (viii) Entrainment zone in the boundary layer is between
 (a) MBL and SBL (b) Free atmosphere and MBL (c) NBL and CBL
 (d) None of these
- (ix) Neutral stability is valid for
 (a) Logarithmic velocity profile (b) Log-linear velocity profile
 (c) Weibull distribution profile (d) Gaussian distribution profile
- (x) The depth of the boundary layer is greater for
 (a) Stable atmosphere (b) Unstable atmosphere (c) Neutral atmosphere
 (d) Inversion

Q2. (a) Describe power law profile with formula. [2]

(b) Find out the velocity at the height of 20 metres from the surface of the Earth if the atmospheric stability is moderate. Use power law profile. Given that [4]

(i) For moderate stability, $n=0.33$

(ii) Reference height from the surface of the Earth = 10 metres

(iii) Reference wind velocity = 2.5 m/s

$$z_2 \left(\frac{z_1}{z_2} \right)^n$$

- Q3. (a) Define lapse rate. [2]
(b) Differentiate between DALR and SALR. [2]
(c) Define mixing height and mixing depth with a neat figure [2+2+2]
- Q4. (a) Explain Instrument Detection Limit and Limit of Detection. [4]
(b) The monitoring of $PM_{2.5}$ at a station for 10 days showed the following concentrations (in $\mu g/m^3$): 47, 44, 70, 49, 61, 52, 62, 70, 48 and 42. Calculate their mean, standard deviation and coefficient of variation. [1+2+2 = 5]
- Q5. (a) Name the gas law which is used as the basis for calculation of correction factor in calibration of instruments. [1]
(b) Define ventilation in indoor space. [1]
(c) Enclosed spaces inhabited by humans lead to (i) _____ (increase/decrease) in CO_2 level, (ii) _____ (increase/decrease) in oxygen level and (iii) _____ (increase/decrease) in temperature. [3]