P. P. SAVANI UNIVERSITY

Third Semester of B.Sc. Examination

December-2021

SSES2090– Fundamentals of Air Pollution

10.12.2021, Friday **Time: 09:00 a.m. to 11:30 a.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

Section-I (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a Which protective blanket nurtures life on the earth and protects it from the hostile environment of outer space?

A Atmosphere
B Troposphere
C Stratosphere
D Thermosphere

1.1b At any given time, ozone molecules are _____formed and destroyed in the stratosphere.

A Steadily
B Constantly
C Slowly
D Abruptly

1.1c The amount and the intensity of insolation _____during a day, in a season and in a year.

A Vary
B Remains same
C Both A and B
D Only A

1.1d The mathematical relation between concentration of pollutants and wind velocity is

A Inverse
B Direct
C Both A and B
D None of the above

1.1e When an air parcel becomes more buoyant, it tends to continue upward motion in which atmospheric condition?

A Stable atmospheric condition

B Unstable atmospheric condition
C Inversion
D Radiation cooling

1.1f The percentage of nitrogen in atmosphere is
A 78.08%
B 81.32%
C 28.59%
D 8.73%

1.1g Chemical species in the atmosphere excited due to absorption of light may also undergo _____through loss of an electron.
A Photoionization
B Ionization
C Dissociation
D Photodissociation

1.1h Photodissociation of molecular oxygen results in _____oxygen atoms.
A 2
B 1
C Both A and B
D Only A

1.1i What is the average amount of stratospheric ozone throughout the world?
A 200 D.U.
B 100 D.U.
C 300 D.U.
D 700 D.U.

1.1j Damage to the ozone layer started in approximately _____ and was initially observed in the polar regions.
A 1986
B 1978
C 1980
D 1998

1.2 Answer the Following: (MCQ/Short Question/Fill in the Blanks) **[05]**

1.2a Atmospheric motion is not controlled by the interplay between the pressure-gradient force and the Coriolis force. (True/False)

1.2b Air naturally moves from the areas of high pressure to low pressure, which causes the vertical movement of air. (True/False)

1.2c _____shows the frequency of winds blowing from particular directions.

1.2d _____ is very desirable for preventing pollution, since the effluents will be rapidly dispersed, through the atmosphere.

1.2e At any given time, ozone molecules are constantly formed and destroyed in the stratosphere. (True/False)

Q.2 Short Notes (Attempt any two) [06]

A Enlist all the layers of atmosphere and describe troposphere and stratosphere.

B Explain the process of ozone formation in the stratosphere.

C Illustrate chemical and photochemical reactions in atmosphere.

Q.3 Explain in detail (Attempt any two) [14]

A With a diagram, explain superadiabatic/unstable atmospheric stability.

B Explain hadley, ferrel and polar cells.

C What do you understand by pressure gradient force? Explain looping plume.

Section-II (Total Marks - 30)

Q.1 Short Questions [10]

1.1 Objectives [05]

1.1a Effective dispersion of pollutants in the atmosphere depends primarily on

A Degree of stability of the atmosphere

B Strength of the wind

C Both a and b

D None of the above

1.1b Environment lapse rate (ELR) is the temperature decrease at the rate of

A 10°C/km

B 5°C /km

C 6.5°C /km

D 9°C /km

1.1c When Environment lapse rate is greater than dry adiabatic lapse rate then prevailing condition in the atmosphere is

A Unstable

B Stable

C Neutral

D Conditionally stable

1.1d Pollutants are trapped in the air in

A Radiation inversion

B Subsidence inversion

C Both and b

D None of the above

1.1e Looping Plume occurs in

A Sub adiabatic conditions

B Unstable conditions

C Super adiabatic conditions

D Both b and c

1.1f Triple cells per Hemisphere are

A Hadley cell
B Ferrel cell
C Polar cell
D All the above

1.1g Wind rose gives the concise information about
A Wind speed
B Wind direction
C Wind frequency
D All the above

1.1h Atmospheric motion is controlled by the interplay between the
A pressure-gradient force
B coriolis force
C Both a and b
D None of the above

1.1i Most dangerous plume as contaminants are coming down to ground level is
A Coning
B Looping
C lofting
D Fumigation

1.1j Plumes are
A Large parcels of air rising the surface
B Small parcels of air rising the surface
C Large parcels of air sinking down
D Small parcels of air sinking down

1.2 Answer the Following: (MCQ/Short Question/Fill in the Blanks) **[05]**

1.2a Initial plume rise determines subsequent pollutant concentrations measured near the ground. (True/False)

1.2b What is inversion?

1.2c Which inversion is associated with atmospheric high-pressure systems?

1.2d Temperature inversions trap pollutants close to the ground. (True/False)

1.2e The earth's surface receives most of its energy in _____wavelength.

Q.2 Short Notes (Attempt any two) **[06]**

A Write a short note on wind rose.
B Define lapse rate and its types.
C Discuss shortly on Mixing height and stack height.

Q.3 Explain in detail (Attempt any two) **[14]**

A Define plumes and significance of plume rise. Discuss different type of plumes.
B Elucidate on different types of stability and instability conditions in the atmosphere.
C Explain Gaussian plume dispersion model.