BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

UG

Name: …… Roll No.: ……..

Branch: …… Signature of Invigilator: ……

Semester: VIth Date: 26/04/2022 (MORNING)

Subject with Code: CE420 AIR POLLUTION AND CONTROL

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE

1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.
2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**
3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.
4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.
5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.
6. Write on both side of the leaf and use pens with same ink.
7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.
8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.
9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.
10. Always maintain the highest level of integrity. Remember you are a BITian.
11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : VI**
BRANCH: Civil **Engg.** **SESSION : SP22**
SUBJECT: CE420 AIR POLLUTION CONTROL
TIME: 2 hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 2 sections, Sec-A and Sec-B. Both sections are compulsory.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied: NA

Section A

Q.1 Which one of the following pollutants or pairs of pollutants is formed due to photochemical reactions? [1]
a) CO alone
b) O3 and PAN
c) PAN and NH3
d) NH3 and CO

Q.2 Which one is not a criteria air pollutant as per USEPA. [1]
a) Carbon monoxide ,
b) Nitrogen oxides,
c) Nickel,
d) Lead

Q.3 1. What is the term used to describe the natural air exchange that occurs between a building? [1]
a) Infiltration
b) Sedimentation
c) Combustion
d) Inhalation

Q.4 4. Which of the gas is related to Bhopal Gas Tragedy of 1984? [1]
a) Methyl Isocyanate
b) Carbon Monoxide
c) Sulphur Dioxide
d) Ozone

Q.5 According to a report released by Greenpeace in Aug, 2019, India is the highest emitter of which of the following pollutants (gases)? [1]
a) Carbon Monoxide
b) Sulphur dioxide
c) Ammonia
d) Nitrogen dioxide

Q.6 On what does the harmful effect of pollution depend on? [1]
a) The concentration of pollutants and the organism
b) The concentration, duration of exposure to pollutants and the organism
c) The concentration of pollutants and duration of exposure
d) The organism only

Q.7 Acid rain is caused by oxides of _____. [1]
a) Phosphorus and Carbon
b) Sulphur and Nitrogen
c) Sulphur and Phosphorus
d) Nitrogen and Carbon

Q.8 Find out **correct** statements regarding Air Quality Index (AQI) in India. [1]
i. It reports the quality of air on daily basis.
ii. Higher the AQI value, the greater the level of air pollution.
iii. India follows 500 points scale.

iv. Monitors record concentration of the major pollutants to calculate AQI.

a) i, ii, iii, iv
b) i, ii, iii
c) ii, iii
d) ii, iii, iv

Q.9 What term is referred to when there is an air exchange between windows or doors that purposely increases air circulation? [1]

a) Combustion
b) Infiltration
c) Natural Ventilation
d) Inhalation

Q.10 Which of these is not a air toxic metals or metal-compounds as per NAAQS India? [1]

a) Mercury
b) Zinc
c) Arsenic
d) Cadmium

Q.11 Stationary sources of air pollution include which of the following? [1]

a) Smoke stack from powder plant.
b) Pollution from motor vehicles and Airplanes.
c) Pollution from locomotives
d) Pollution from Engines and Equipment.

Q.12 Which of the following gases is responsible for restricting oxygen intake? [1]

a) Nitrogen
b) Carbon dioxide
c) Carbon Monoxide
d) Compressed helium

Q.13 …….. (micron) sized particulates can penetrate lungs and are harmful for human health? [1]

a) 10
b) 10 - 15
c) 2.5
d) 1

Q.14 Air Quality Index ranging from 51 – 100 is considered to be _____ . [1]

a) Good
b) Unhealthy for sensitive groups
c) Moderate
d) Unhealthy

Q.15 The lowest pH value of rain when it is clean is _____? [1]

a) 4.8
b) 6.0
c) 5.6
d) 6.6

Q.16 Which of the following suspended matter is liquid particles? [1]

a) Dust
b) Smoke
c) Fumes
d) Mist

Q.17 Which of the following reducing agent is used as a medium during SO2 sampling ? [1]

a) Methanol
b) Ethanol
c) Isopropanol

d) Benzene

Q.18 Which of the following is an instrument that continuously measures opacity ? [1]

a) CEMS
b) COMS
c) CPMS
d) CMS

Q.19 Which of the following acts as surrogate pollutant for VOC ? [1]

a) CO
b) CO_2
c) O3
d) NO_2

Q.20 Modified West-Gaeke Colorimetric is the most common manual method for measuring the atmospheric concentration of [1]

a) NO_2
b) SO_2
c) CO
d) NH_3

Q.21 Additive that can be used to create oxygenated fuel [1]

a) MIBE
b) Benzene
c) Toluene
d) Xylene

Q.22 Which is not an alternative to gasoline [1]

a) Propane
b) Methane
c) Hydrogen
d) Ethanol

Q.23 Which is also known as wood alcohol [1]

a) Methanol
b) Ethanol
c) Propanol
d) Butanol

Q.24 Which of the follo0wing is related to fuel efficiency [1]

a) NO_2
b) HC
c) CO
d) CO_2

Q.25 Which of the following is a very clean fuel? [1]

a) CNG
b) Bio-diesel
c) Propane
d) Electricity

Q.26 Which of the following can poison the catalyst rendering them ineffective by coating the surface of the catalyst, which keeps the exhaust gases from making contact [1]

a) Lead
b) Zinc
c) Both A & B
d) None

Q.27 In spark ignition petrol engines maximum emission of NOX takes place when the air fuel ratio is [1]

a) Very weak mixture and A/F ratio is about 19.
b) Weak mixture and A/F ratio about 17.
c) Chemically correct mixture and A/F ratio about 15.
d) Rich mixture and A/F ratio about 13.

Q.28 In diesel engines, the control of black smoke in exhaust can be achieved by: [1]

i. Running the engine at lower load.
ii. Maintaining the injection system perfect.
iii. Using diesel fuel of higher cetane number.

Which of the above statement are correct:

a) i, ii and iii.
b) i and ii only.
c) i and iii only.
d) ii and iii only.

Q.29 The efficiency of otto cycle is increased by increasing _____ [1]

a) Pressure ratio.
b) Compression ratio.
c) Temperature ratio.
d) None of the above

Q.30 Which of the following system isn't used to control emissions? [1]

a) Air Injection System
b) Exhaust gas recirculation system
c) Catalytic Converter
d) Spark Ignition

Section B

Q.1 Discuss the significance of emission inventory in air pollution management. [5]

Q.2 Suppose the following atmospheric altitude versus temperature data have been collected. [5]

Altitude (m)	0	100	200	300	400	500	600
Temperature (°C)	20	18	16	15	16	17	18

(a) what would be the mixing depth?
(b) how high would you expect a plume to rise if it is emitted at 21°C from a 100 m stack if it rises at the dry adiabatic lapse rate? Would you expect the plume to be looping, coning, fanning, or fumigating?

Q.3 A freeway has 10,000 vehicles per hour passing a house 200 m away. Each car emits an average of 1.5 g/mi of NOx, and winds are blowing at 2 m/s across the freeway towards the house. Estimate the NOx concentration at the house on a clear summer day near noon (assuming that NOx is chemically stable). [5]

Q.4 A baghouse is to be designed to handle 800 m^3/min of air. The filtration takes place at constant pressure so that the air velocity through each bag decreases during the time between clearings according to the relation, [5]

$$v_{bag} = \frac{1}{0.267 + 0.08t}$$

Where v_{bag} is the m^3/min of air per square meter of cloth and t is in min. the bags are shaken in sequence, row by row on a 15-min cycle. Each bag is 30 cm in diameter and 6 m high. The baghouse is to be square in cross-section, with 30 cm spacing between bags and 30 cm clearance from the walls. Calculate (a) the number of bags required and (b) the width of the baghouse.

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