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| Scheme of Valuation/Answer Key (Scheme of evaluation (marks in brackets) and answers of problems/key) | | | | | |
| **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  VI SEMESTER B. TECH DEGREE EXAMINATION, APRIL 2019 | | | | | |
| **Course Code: CE374** | | | | | |
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| Max. Marks: 100 | | |  | Duration: 3 Hours | |
| **PART A** | | | | | |
|  |  | ***Answer any two full questions, each carries 15 marks.*** | | | Marks |
| 1 | a) | Standard definition of Air pollution **(2 Marks)**  Normal composition of atmospheric air **indicating the percentages (% by Volume) of any Four constituents** like Nitrogen (78.08%), Oxygen (20.95%), Argon (0.93%), CO2 (0.036%) etc**(4\*0.5 Marks)** | | | (4) |
| b) | Explaining the **Four mechanisms** through which air pollutants affect materials with examples.  ie., 1) Corrosion 2) Abrasion 3) Deposition and Removal 4) Direct and Indirect chemical attack | | | 4) |
| c) | Definition of IAP **(1 Mark)**  Major sources of IAP- Tobacco smoke, Radon gas, VOCs and Ultrafine PM  **(2 Marks)**  Effects of IAP like Sick Building Syndrome, Asthma and other respiratory diseases **(2 Marks)**  Remedial measures of IAP like Proper Ventilation (Natural/Cross ventilation, Infiltration & Artificial/ Mechanical ventilation), Use of low toxicity building materials, Monitoring of Indoor air quality, Ban of smoking, Provision of chimneys, Prevention of Radon infiltration through proper maintenance of foundation and basement etc**(2 Marks)** | | | (7) |
| 2 | a) | Defining primary and secondary air pollutants **(2\*1.5 Marks)**  Examples of primary and secondary air pollutants **(2\*0.5 Marks)** | | | (4) |
| b) | Explanation of green house effect | | | (4) |
| c) | Classification of air pollutants by giving importance to their sources of origin particle size etc.  **Natural Contaminants**: Pollen grains, Volcanic ash, Microorganisms etc  **(1 Mark)**  **Particulate/Aerosols**: Dust, Smoke, Mist, Fog and Fumes **(3 Marks)**  **Gaseous air pollutants**: SO2, NO2, CO, Ground level O3, HF, HCl, Formaldehyde etc**(3 Marks)** | | | (7) |
| 3 | a) | Mechanism of action of air pollutants on human **(1 Mark)**  Effects of air pollution on human life **(5 Marks)**  Effect of air pollution on plant life like Necrosis, Chlorosis, Abscission, Epinasty and Growth retardation **(3 Marks)** | | | (9) |
| b) | Short note on any one air pollution episode including the reason/cause and effects of that episode | | | (6) |
| **PART B** | | | | | |
| ***Answer any two full questions, each carries 9 marks.*** | | | | | |
| 4 | a) | Listing of Meteorological Parameters  **Primary Parameters**: Wind direction and speed, Temperature, Atmospheric stability and Mixing height **(4\*0.5 Marks)**  **Secondary Parameters**: Precipitation, Humidity, Solar radiation and Visibility  **(4\*0.5 Marks)** | | | (4) |
| b) | Gaussian plume model equation with description of each term and its significance | | | (4) |
| c) | Definition and significance of atmospheric inversion **(3 Marks)**  Explaining **Radiation inversion and Subsidence inversion(2\*2 Marks)** | | | (7) |
| 5 | a) | Definition of atmospheric stability **(2 Marks)**  Explaining different types of atmospheric stability with figures (**Unstable, Neutral, Weakly Stable and Stable** based on **Environmental lapse rate and Adiabatic lapse rate**)**(2 Marks)** | | | (4) |
| b) | List any Four disadvantages of Gaussian plume model **(4\*1 Mark)** | | | (4) |
| c) | Definition of Lapse rate **(2 Marks)**  Explaining different types of lapse rates such as **Adiabatic lapse rate (Sub & Super adiabatic), Isothermal lapse rate, Neutral lapse rate**etc**(5 Marks)** | | | (7) |
| 6 | a) | Definition of Plume (1 Mark)  Explanation of different types of plumes such **as Looping plume, Coning plume, Fanning plume, Lofting plume, Fumigation and Trapping plume** with figures **(8 Marks)** | | | (9) |
| b) | Any Six assumptions of Gaussian plume model:  – Steady-state conditions (constant source emission strength)  – Wind speed, direction and diffusion characteristics of the  plume are constant  – Mass transfer due to bulk motion in the x-direction far  outshadows the contribution due to mass diffusion  – Conservation of mass, i.e. no chemical transformations take  place  – Wind speeds are >1 m/sec.  – Limited to predicting concentrations > 50 m downwind | | | (6) |
| **PART C** | | | | | |
| ***Answer all questions, each carries 3 marks.*** | | | | | |
| 7 | a) | Brief description about sampling principles like Size and frequency of sampling, Selection of sampling instrument based on whether the sampling is continuous or intermittent and based on the nature of the pollutant, Sampling of flue gas, Sampling in open air etc | | | (7) |
| b) | Explaining the significance of NAAQS **(2 Marks)**  List out the permissible concentrations of various air pollutants as per NAAQS  **(5 Marks)** | | | (7) |
| c) | Principle of electrostatic precipitation **(2 Marks)**  Working of ESP **(2 Marks)**  Advantages and Disadvantages of ESP **(2 Marks)** | | | (6) |
| 8 | a) | Explanation of various gaseous pollutant sampling techniques like **Air displacement method, Absorption, Adsorption, Condensation/ Freeze out sampling** | | | (7) |
| b) | Enlisting of Particulate emission control methods**(2 Mark)**  Explanation of any three Particulate emission control methods like **Settling Chambers, Inertial separators, Cyclones, Fabric filters, ESP, Scrubbers/Wet collectors etc (5 Marks)** | | | (7) |
| c) | Definition of AQI **(3 Marks)**  Uses of AQI **(3 Marks)** | | | (6) |
| 9 | a) | Explain in detail about any Four Particulate matter sampling techniques like **Sedimentation, Filtration, Impingement, ESP, Thermal precipitation & Centrifugal methods (4\*3 Marks)** | | | (12) |
| b) | Brief description about the gaseous emission control methods like **Combustion/Thermal method, Absorption & Adsorption** | | | (8) |
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