

**INSTRUCTIONS TO PAPER SETTERS:****MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from question no. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only one question from each unit.

**UNIT – I**

Concept of unpolluted air, Gaseous and vapour pollutants in atmosphere, Scales of air pollution, Primary & secondary pollutants, Ambient Air Quality, Monitoring for pollutants (SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, PAN, Particulates, Hydrocarbons, PAH's) and their health effects. Stack monitoring for SO<sub>x</sub>, NO<sub>x</sub>, CO, CO<sub>2</sub>, Hydrocarbons, Fluorides, Ammonia, VOCs, Effects of air pollution on vegetation, materials and structures.

Stack monitoring for thermal power plant, Oil refinery industry, Fertilizer industry, Non ferrous metal industry. Recent techniques of online stack monitoring, Emission inventory.

Trends of AAQ in Urban, Rural and Industrial areas.

**[No. of Hours: 10]****UNIT – II**

Air quality criteria, National & International air emission standards and AAQ guidelines, Indoor air quality, Averaging time, Air pollution system, Alternative control strategies. Elements of Meteorology, Solar radiation, Wind circulation, Lapse rate, Stability conditions, Wind velocity profiles, Maximum mixing depth, Wind rose, Turbulence. General characteristics of stack plumes, Heat island effect.

Eddy diffusion model, Gaussian dispersion model, Evaluation of standard deviation, Estimation of maximum ground level concentration.

**[No. of Hours 11]****UNIT – III**

GLC estimates for multiple sources using standard software (eg. EPA's ISC model). Determination of effective stack height, Distribution & sources of Particulate matter, Hood duct design, Particulate collection mechanisms, Control systems and their design.

**[No. of Hours 10]****UNIT –IV**

Flue-gas desulfurization processes, Flue gas control methods for NO<sub>x</sub>.

Emission standards for automobiles, Origin of exhaust emissions from gasoline, Diesel, CNG & LPG engines. Crankcase and evaporative emissions, Emission reduction by fuel changes, Emission reduction by engine design changes, Catalytic converters, Diesel engine emissions.

**[No. of Hours: 10]****Text and Reference Books:**

1. M.N. Rao & H.V.N. Rao, "Air Pollution", Tata McGraw- Hill.
2. Richard W. Boubel, Donald L. Fox, D. Bruce Turner & Arthur C. Stern, "Fundamentals of Air Pollution, Hardcover."
3. Air pollution its origin and control, "Kenneth Wark, Cecil F. Warner".
4. A.K. De, "Environmental Chemistry," New Age International Publisher.
5. P. Narayanan, "Environmental Pollution Principles, Analysis and Control", CBS Publication.
6. S.V.S. Rana, "Essentials of Ecology and Environmental Science", Prentice Hall of India.
7. C.S. Rao, "Environmental Pollution Control", New Age International Publishers.
8. Tom Lyons and Bill Scott, "Principles of Air Pollution Meteorology", CBS Publishers and Distributors.