IFET COLLEGE OF ENGINEERING
DEPARTMENT OF AI&DS, AI&ML, CIVIL, CSE & IT

SUBJECT CODE: 23CH6603 **YEAR/SEMESTER: III/VI**
SUBJECT NAME: WATER AND SOIL CONSERVATION

UNIT- II - WIND EROSION AND DEPOSITION

APPLICATIONS AND SOLVED

PART-B

6. Identify the characteristics of wind that influence the amount of soil that is eroded and describe how each characteristic affects the erosion process. **K4** **(16 Marks)**

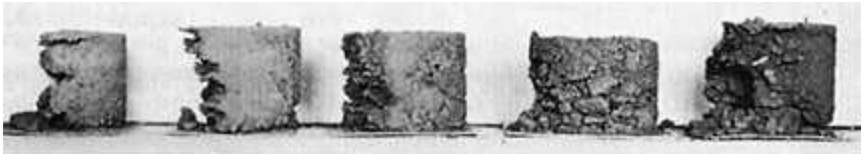
The detaching capacity of wind

The detaching capacity of wind is related to its friction velocity, or shear stress, and to the size of the erodible grains.

$$D = f(u)^2$$

Where, D = detaching capacity, g/cm2, u = friction velocity over an eroding surface, cm/s

A sharp velocity gradient near the soil causes grains that protrude higher into the wind stream to be struck by stronger wind force. Larger particles stick up higher, but their larger mass requires more force to detach them. Any particle from 0.05 to 0.5 mm in diameter can be detached if the wind is strong enough, but those from 0.1 to 0.15 mm are the easiest to detach of any grains that move in saltation. Silt- and clay-sized grains (< 0.05 mm) and very coarse sand and gravel sizes (> 1.0 mm) cannot be separated from the soil mass even by strong winds if they are free of saltating particles. Fine particles can only move in saltation if they are bound together into aggregates of the right size. Winds containing abrasive material can detach both smaller and larger grains. These abrasive materials not only detach erodible grains from the soil, they also abrade nonerodible clods, detaching small erodible grains from them. If the wind continues long enough, whole clods may be disintegrated. **(4 Marks)**



Transporting Capacity of Wind **(4 Marks)**

Transport capacity of wind is related to wind velocity, but not to soil-grain size. Greater numbers of smaller-sized grains can be picked up, but the total weight of material that a specific wind can carry remains relatively constant. The proportion of material in suspension, saltation, and creep depended on the aggregate- and particle-size composition of the soil. Minor quantities of suspended material were found over very coarse-textured soils and over strongly aggregated, fine-textured soils. Quantities of creeping particles were relatively large. Suspension was greater and creeps noticeably smaller over dusty, silty, and fine sandy soils. In every soil Chepil studied, the amount of material in saltation was always greater than that in suspension and creep combined. Amounts in suspension ranged from 3 to 38%, in saltation from 55 to 72%, and in creep from 7 to 25% of the moving soil.

The rate of dune sand and soil movement by wind (weight of material moving past a unit width, normal to the direction of movement, per unit time) was related to the third power of the friction velocity:

(4 Marks)

$$q = \frac{\rho}{g} * u^3$$

Where, q = rate of soil movement, g/(cm width)-s ρ = air density, g/cm3

g = gravitational constant, 980 cm/s2

u = friction velocity over an eroding surface, cm/s2 **(4 Marks)**

The relationship between amount of soil removed from a unit area and erosive wind force probably has greater significance than that between rate of loss and wind force.

X= f(u)5

Where, X = the transportation capacity, g/cm2

This relationship is influenced by a number of factors, but the total soil removal appears to be proportional to the fifth power of the friction velocity.