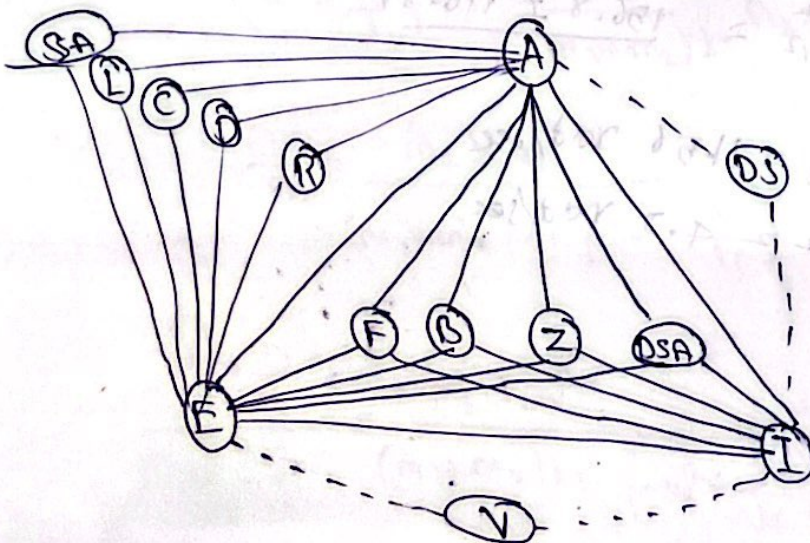


AEROELASTICITY:-

It is defined as the mutual interaction of aerodynamic forces, Inertial forces and elastic forces on a structure. The problem was largely unknown in the early days, because the aircraft at that time were flying at low speed and had rigid structure. However the problem started to become serious when aircraft speed increases and the wing structures become less rigid, one of the reasons why aircraft structure is not rigidly build is because rigid structures are usually heavier, when compared to less rigid structure. Heavy aircraft costs more to operate when compared to lighter aircraft. As a result, many aircraft are prone to experience many aeroelastic phenomenon such as buffeting, divergence & flutter. Among these phenomena flutter is considered the most dangerous of all.

i) Aero elastic phenomena:-

ii) flutter  
iii) collor's triangle of aero-elastic force.



A: Aerodynamic Force

E: Elastic force

I: Inertia Force

V: Mechanical Vibration

Ds: Dynamic stability

F: Flutter

B: Buffeting

Z: Dynamic Response

L: Load distribution

D: Divergence

C: Control effectiveness

R: Control system reversal

DSA: Aeroelastic effect on dynamic stability

SSA: Aeroelastic effect on static stability

### Flutter (F)

A dynamic instability occurring in an aircraft in flight, at a speed, is called the flutter speed, where the elasticity of the structure play an essential part in the instability.

### Buffeting (B)

Transient vibration of the aircraft structural components due to aerodynamic impulses produced by the wake behind the wing, nacelles, fuselage pod, or other components of the aircraft.

### Def. Dynamic response (Z)

Transient Response of the aircraft structural components produced by rapidly applied load due to gust, landing and gun reaction, moving shock wave or other dynamic loads.

## Aeroelasticity on stability. S

Influence of the elastic deformation of the structure on dynamic and static airplane stability

### load distribution :-

Influence of the elastic deformation of the structure on the distribution of the aerodynamic pressure over the structure.

### Divergence, D<sub>s</sub> speed :-

A static instability of a lifting surface of the aircraft in flight at a speed called Divergence Speed, where the elasticity of the lifting surface plays the essential role in the instability.

### Control effectiveness, (C)

Influence of the elastic deformation of the structure on the controllability of the airplane.

### Control system Reversal (R)

A condition occurring in flight, at a speed called the control reversal speed, at which the intended effects of displacing a given component of the control system are completely nullified by elastic deformation of the structure.