Assignment : 3 Balancing

1.	What do you mean by balancing of rotating masses? What is the need of balancing?
2.	Explain Graphical and Analytical Method of Balancing of Several Masses rotating in same plane.
3.	Explain Graphical and Analytical Method of Balancing of Several Masses rotating in different planes.
4.	Explain Balancing of Reciprocating Masses in Single Cylinder Engines.
5.	Explain Balancing of Reciprocating Masses in Multi-Cylinder Inline Engines.
6.	Explain Concept of Direct and Reverse Cranks.
7.	What is Partial Balancing of Locomotives? Explain effect of Partial Balancing of Locomotives such as variation of tractive force, Swaying Couple, Hammer Blow.
8.	Explain Balancing of V engines.
9.	Explain Balancing Machines.

Examples

1.	Four masses m1, m2, m3 and m4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.
2.	A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.
3.	A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that between the masses at B and A is 190°, both being measured in the same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, determine : 1. The magnitude of the masses at A and D; 2. the distance between planes A and D; and 3. the angular position of the mass at D.

4.	A two cylinder locomotive engine has following specifications: Reciprocating masses/cylinder = 300 kg Crank Radius = 290 mm Angle between crank = 900 Driving wheel diagram = 1780 mm Distance between cylinder centres = 640 mm Distance between driving wheel plans = 1530 mm Determine: (1) The fraction of reciprocating masses to be balanced if the hammer blow is not to exceed 45 kN at 95 km/hr speed. (2) The variation in the tractive effort. (3) The magnitude of swaying couple.
5.	The following data refers to an inside cylinder locomotive: Mass of reciprocating parts/cylinder : 36 kg Revolving masses/cylinder : 16 kg Pitch of the cylinder : 700 mm Angle between crank : 900 Length of each crank : 320 mm Wheel tread diameter : 1900 mm Distance between plans of wheel : 1800 mm Limiting speed of locomotive : 100 kmph If total revolving masses and 2/3 of the reciprocating parts are to be balanced, determine : Variation of tractive force. Maximum swaying couple.