**4-MOTION IN A PLANE**

**1. Composition of Vectors**

1. By triangle law or parallelogram law of vector addition, the magnitude of resultant of two vectors and inclined to each other at angle, is given by  2. If resultant makes an anglewith, then 

**2. Expressing the Vectors in terms of Base Vectors and Rectangular Components of Vectors**

1. If *Ax*, *Ay,* *Az* are the rectangular components of and are the unit vectors along *X -,Y*- and Z-axis respectively, then  2.  3.  4. If vector makes anglewith the horizontal, then horizontal component of  vertical component of  and 

**3. Scalar or DOT Product of two Vectors**

1.  2. If  and  3. Anglebetween andis given by 

4. In terms of rectangular components  5. Work done,  6. Power 

**4. Vector or Cross of two Vectors**

 2. Unit vector perpendicular to the plane of vectorsand is given by  3. Anglebetween vectorsand  is given by  4. In terms of rectangular components, we have     *Ax Ay Az Bx  By* *Bz*

or 5. For parallel vectors,  6. Moment of a force or torque, 

**5. MOTION IN A PLANE**

1. Distance is the length of actual path traversed by a moving body between its initial and final positions. 2. Displacement is the shortest distance between the initial and final positions of a body. 3. Average speed =  5. Instantaneous velocity,  6. Instantaneous acceleration,  **6. Relative Velocity of two inclined Motions**

1. The relative velocity of *A* w.r.t  2. The relative velocity of *B* w.r.t.  3. For two objects moving with velocities and  at an angle , the relative velocity of an object A w.r.t. B is given by  4. If velocity *vAB* makes anglewith *vA*, then 

**7. Projectile Fired Horizontally**

1. Positive of the projectile after time *t*  ,  2. Equations of trajectory:  3. Velocity after time *t*:   4. Time of flight:  5. Horizontal range: R 

**8. Projectile Fired at an Angle with the Horizontal**

1.For a projectile fired with velocity *u* at an angle  with the horizontal :  ,  2. Position after time t: , 

3. Equation of trajectory :

 4. Maximum height:  5. Time of flight,  6. Horizontal range,  7. Maximum horizontal range is attained at and its value is  8. Velocity after time *t*, *vx* =   and 

**9.Uniform Circular Motion** 1. Angular displacement,  2. Angular velocity,  3. Also,  4. Linear velocity  5. Centripetal acceleration,  6. Linear acceleration, *a = r α*