**Assignment 4**

1. Suppose a weight ‘w’ is shifted horizontally by a distance ‘d’. Shift in the center of gravity of the ship of displacement ‘W’ would be;
2.  b)  c) d/2 d) d
3. If G0G1 is the horizontal shift in center of gravity of a vessel, and GM of the ship is known, the ship heels by φ given as;
4. tan φ =  b) cos φ =  c) tan φ =  d)None of the above

3. Free surface effect occurs in a vessel if;

a) Tank in the vessel is full b) Tank in the vessel is half full c) there is no tank d) None of the above

4. Free surface moment is directly proportional to

a) Volume of the tank b) 2nd moment of area of the tank c)waterplane area of the tank

d) none of the above

Questions 5-8 are from the following problem.

A vessel displacing 10000 tonnes KG 8.9m KM 9.4m;The vessel loads ballast water of RD 1.01 into a rectangular tank of length 30 m, breadth 20m depth 2m; The tank is filled upto 1m and has a centerline division to that height. Kg of ballast 0.5 m.

5. Weight of the ballast is

a) 1000 tonne b) 606 tonne c) 490 tonne d) none of the above

6. KG of the ship + ballast is

a) 8.9m b)8.0m c) 8.42m d)0 m

7. The virtual rise in center of gravity due to free surface effect is:

a) 0.476 m b) 0.112m c)0 m d) none of the above

8. KG of the vessel after including free surface effect is:

a) 9.44m b)10.54m c)8.89m d)0m

9. Free surface effect can be reduced by

a) partitioning the tank b)increasing the wetted area c) Heeling the vessel d)none of the above.

10. At small angles of heel, righting arm=

1. GMsinφ b)GMcosφ c) KGsinφ d)KN