**Hydrostatics and Stability Calculations**

Sessional Viva-Voce

1. What is an offset table? How are waterlines and stations closed?
2. What does a closed offset table look like?
3. What is a lines plan?
4. How are buttock lines drawn?
5. What is a section area curve? How is section area calculated?
6. How is the underwater volume calculated? Mention at least two ways.
7. If the dimensions are halved, how does the Area of waterplane change?
8. If the dimensions are halved, how does the volume change?
9. How is the weight calculated? Give at least 2 methods.
10. How is the VCG calculated? How is the LCG calculated?
11. What is a weight distribution curve?
12. What are fineness ratios? How are they calculated? How do the fineness ratios vary with draft?
13. What is the necessary condition for stability?
14. What is a buoyancy distribution curve? Weight- buoyancy distribution curve : Area = ?
15. What is GML? How is it calculated? What is GMT? How is it calculated?
16. What is TPC and how is it calculated? What is MCT\_1cm and how is it calculated?
17. How does TPC vary with draft? How does MCT\_1cm vary with draft?
18. If the deck is removed, what happens to the VCG and VCB?
19. How does waterplane area vary with draft? How does buoyancy vary with draft?
20. How do BMT, VCB, VCG, GMT vary with draft?
21. Draw a midship section and estimate its VCG. Draw a midship section and estimate its VCB.
22. Draw VCB and VCG as a function of length.
23. Distinguish between flare and tumble home by TPC and MCT\_1cm plots.
24. If the material changes from Steel to Aluminum, how do the VCG and VCB change?
25. If the thickness changes from 20 mm to 10 mm, how do the VCG and VCB change?
26. If the beam is reduced to half, what happens to VCG, VCB, GMT?
27. If the depth is reduced to half, what happens to VCG, VCB, GMT?
28. Write the trapezoidal rule and Simpson’s three rules.
29. How does the buoyancy vary with draft? Draw plot.
30. Where is the point of inflexion in the MCT\_1cm plot?
31. How do Ixx and Iyy vary with draft?
32. Plot Cp, Cb and Cm on the same plot and identify each.
33. How do BML and GML vary with draft.
34. How is the accuracy of numerical integration measured and improved?
35. As draft increases, the buoyancy distribution curve approaches which curve? Why do the edges change?
36. How does the deck plate mass distribution vary with x?
37. In lightship condition, how does the ship trim and why?
38. How does the ship react when weights are added or subtracted?
39. How does the curve of statical stability change with vertical and horizontal shift of weights?
40. A ship trims about which point? How is it calculated?
41. What are the 6 degrees of freedom?
42. Which are the DOF motions visible in sheer plan, body plan, half-breadth plan?
43. Write analytical formulae to calculate Water plane area characteristics. (Area and first moments)
44. Write analytical formulae to calculate Volume characteristics. (Volume and first moments)
45. Write analytical formulae to calculate Water plane area characteristics. (second moments)
46. Define metacentre. Is it a function of draft, heel and damage?
47. Explain free surface effect? What is a virtual rise in CG? How should tankers be framed?
48. What is the effect of suspended weights on the ship’s stability?
49. What is the effect of change of water density on the ship’s stability?
50. How is the stability at large angles calculated?
51. What are cross-curves of stability?
52. What is angle of loll?
53. In dynamical stability, when does the ship stabilize? What is the maximum angle of heel?
54. What is the value of the minimum GM in intact and damaged conditions according to IMO?
55. What is the angle of loll in a wall-sided vessel?
56. Calculate the area and moments of an isosceles right-angled triangle about it hypotenuse.
57. Explain the stability of a completely submerged body. Draw the curve of statical stability. BM =?
58. Explain Archimedes principle and Pascal’s law.
59. What happens to draft, trim and heel in case of damage?
60. For the same displacement, which is more stable : a monohull or a twin-hull vessel? Why?
61. Explain roll motion with respect to the curve of statical stability.
62. Explain trim and trim angle. In the lightship condition, what is the trim?
63. Draw the buoyancy distribution curve in the trimmed condition.
64. Define floodable length, margin line. What is Plimsolle Line? What is freeboard? What is reserve buoyancy?
65. How is floodable length calculated?
66. Explain the lost buoyancy method.
67. In the damaged condition, what is the residual moment of inertia of the damaged waterplane?
68. From the buoyancy distribution curve, explain what is the lost buoyancy?
69. How is the AutoCAD drawing scaled to the paper drawing?
70. What is a baton and how is it used? What is a French curve? Where and how is it used?
71. How is the diagonal drawn?
72. How are waterlines and stations closed on paper?
73. What are Bonjeans? Plot them.
74. What happens to draft, trim and heel in case of damage?
75. How is residual buoyancy calculated on damage?
76. Explain stable, unstable, and neutral equilibrium.
77. Weight is added. How do the weight and buoyancy distribution curves change?
78. Draw the lines plan of a barge. Plot the weight and buoyancy distribution curves.
79. For a barge, draw the TPC, MCT\_1cm, fineness ratios as functions of draft.
80. For a barge, plot BMT, BML, GMT, and GML as functions of draft.
81. Given a buoyancy distribution curve, mention the trim qualitatively.
82. How does the centre of buoyancy shift due to trim?
83. Is the lightship stable by IMO standards?
84. Plot VCG and VCB as functions of x.