**High Performance Marine Vehicles (NA409)**

**Part A: 2 Marks question**

1. What is the difference between conventional vessels and high speed craft?
2. Write the name of conventional vessels and high performance craft?
3. Which are the forces are predominant in displacement, Semi-displacement and high performance craft?
4. What is the maximum speed of planning vessel? Why speed is restricted at this value?
5. Why all high speed crafts are used for any type of mission? What are the advantages and disadvantages?
6. What is the purpose of using multihull instead of monohull?
7. What is full form of SWATH?
8. What is full form of SWASH?
9. Is SWATH stable in pitch? Why?
10. Is SWATH stable in roll? Why?
11. Is SWATH gives more responses in pitch compared to same displacement monohull? Why?
12. High length to beam ratio provides …………………. Wake profiles.
13. Effect of low Wash on resistance of ship.
14. HYSWAS stands for……………..
15. What is hull-borne and foil-borne condition in case of hydrofoil craft?
16. What is the meaning of piercing?
17. Define Guidance and control of the ship.
18. What is earth fixed co-ordinate system and body fixed co-ordinate system.
19. Which hydrodynamic derivatives can be derived from rotating arm test?
20. Which hydrodynamic derivatives can be derived from planer motion mechanism (PMM) test?
21. What are the conditions for ship to be stable?
22. Define and draw a sketch a diagram to indicate rake angle and skew angle.
23. What is the difference between the nominal wake and the effective wake?
24. Explain momentum principle.
25. The momentum theory of propellers is said to be based on correct fundamental principles while the blade element theory is said to rest on observed facts. Explain.
26. What are the conditions that must be fulfilled in carrying out model tests with propellers?
27. Why does thrust deduction occur?
28. What are the major non-dimensional parameters used to describe a screw propeller?
29. Which type of propellers is used in high speed vehicles? Why?

**Part B: 4 Marks question**

1. Write a note on closed control loop with schematic diagram.
2. How to d9ifferentiate displacement, Semi-displacement and high performance craft using the speed range?
3. Write down the types of high speed craft with tree diagram.
4. Write a note on semi-planning hull with schematic diagram.
5. Write a note on planning hull with schematic diagram.
6. What is the difference between semi-planning and planning hulls?
7. Write down the types of multihull. What is difference between SWATH and CATAMARAN?
8. Write a note on CATAMARAN with proper schematic diagram.
9. Write a note on TRIAMARAN with proper schematic diagram.
10. Write a note on SWATH with proper schematic diagram.
11. Write a note on semi-SWATH with proper schematic diagram.
12. Write a note on SWASH with proper schematic diagram.
13. What are advantages and disadvantages of CATAMARN?
14. What are advantages and disadvantages of SAWTH?
15. What are advantages and disadvantages of semi-SWATH?
16. What are advantages and disadvantages of TRIMARAN?
17. What are advantages and disadvantages of SWASH?
18. Is SWATH gives more responses in pitch compared to same displacement monohull? How to overcome this problem?
19. What are advantages and disadvantages of small water-plane area in case of SWATH?
20. What is relationship between water-plane area of ship with stiffness, damping and natural frequency? Explain with appropriate formula.
21. What is chine in context with planning hull? What are advantages of it? Draw a diagram of hard chine and double chine for monohull?
22. What is displacement CATAMARAN?
23. What is displacement planning CATAMARAN?
24. What is displacement low wash CATAMARAN?
25. What is displacement wave piercing CATAMARAN?
26. What is WASH or Wake? Is there any adverse effect on nearby ships?
27. What is effect of small water-plane area of ship on natural frequency of ship? Explain with the help of appropriate formula.
28. What is difference between SWATH and semi-SWATH? Explain with proper diagram.
29. What is the possible way to reduce pitch responses of SWATH ship?
30. What is hydrofoil? Explain cambered and symmetrical hydrofoil with CL vs α of each?
31. What is stalling angle in context of hydrofoil.
32. What are the advantages of wave piercing CATAMARN over conventional CATAMARAN?
33. Write a note on HYSWAS with proper schematic diagram?
34. What is Hydrofoil craft? Types of hydrofoil craft.
35. Write a note on surface piercing hydrofoil craft?
36. Write a note on fully submerged hydrofoil craft?
37. Write a note on hydrofoil CATAMARAN?
38. What are advantages of hydrofoil craft?
39. What is controllability? Explain course-keeping, course- changing (Maneuvering) and speed changing.
40. Explain ship controllability.
41. Write a note on hovercraft with proper schematic diagram? Types of hovercraft?
42. Write a note on Air cushion vehicle (ACV) with schematic diagram?
43. Write a note on Air cushion vehicle with aft skegs (ACVAS) with schematic diagram?
44. Write a note on surface effect ship (SES) with schematic diagram?
45. Define heading angle and drift angle of the ship.
46. What is purpose of maneuvering test in naval architecture? Write the types of maneuvering test performed on ship.
47. Explain turning test with proper diagram.
48. Explain overshoot and zigzag test performed on ship. What is measure of this test?
49. Explain advance, transfer, tactical diameter, steady turning radius, Pivot point in context with turning circle test.
50. Explain spiral test with neat diagram.
51. Explain pullout test with neat diagram.
52. Explain stopping test with neat diagram.
53. Explain IMO criteria for advance, transfer and tactical diameter.
54. Explain IMO criteria for maneuvering of ship.
55. What are the captive model tests performed on ship?
56. Why captive model test performed on ship model? Explain the tests performed on ship model?
57. How to find out all hydrodynamic derivatives of ship model.
58. Write a note on straight line test performed on ship model.
59. Which hydrodynamic derivatives can be derived from straight line test?
60. Write a note on rotating arm test performed on ship model.
61. Explain free running model test.
62. Explain with proper graph of righting arm curve (GZ vs Angle of heel(ϕ))
63. On a sketch of a screw propeller, indicate the following: boss, blade, root, tip, face, back, leading edge and trailing edge.
64. Explain the terms rake and skew with reference to a propeller blade, what is skew induced rake? What is warp?
65. What is cavitation? How is cavitation affected by the temperature and the air content of water?
66. What do you understand by the effective power of a ship? Describe the stages by which the power produced by the main engine of the ship is transformed into the effective power.
67. Define for skew propeller with proper diagram: Face, Back, leading edge and trailing edge, Geometric pitch, Pitch, Mean line or camber, Blade thickness
68. Define rake angle and skew angle. Write the advantages and disadvantages.
69. Criteria for deciding propeller blade section.
70. Explain types of ship engines.
71. Describe the different types of cavitation and the conditions under which they occur
72. Explain how cavitation affects the performance of propeller. Describe the types of cavitation.
73. A propeller of 2m diameter produces a thrust of 30 KN when advancing at a speed of 4 m/s in sea water. Determine the power delivered to propeller, the velocities in slip stream at the propeller disc and at a section far astern, the thrust loading coefficient and the ideal efficiency.
74. A propeller of 3 m diameter absorbs 700 KW in the static condition in sea water. What is its thrust?
75. Define super cavitation? Draw a blade section of super cavitating propeller.

**Part C: 14 Marks question**

1. Derive the equation of motion of ship for earth fixed co-ordinate axes and body fixed co-ordinate system when center of gravity is overlapping with origin.
2. Write a note on planer motion mechanism (PMM) test on ship model.
3. What is cavitation? What is cavitation number? How to prevent cavitation?
4. Write down types of cavitation? Explain each type properly with the help of diagram.
5. Explain axial momentum theory. Derive the formula for ideal efficiency.
6. Explain impulse momentum theory. Derive the formula for ideal efficiency.
7. Explain blade element theory. Derive the formula for ideal efficiency.
8. A propeller of diameter 4 m has an rpm of 180 when advancing into sea water at a speed of 6 m/s. The element of the propeller at 0.7R produces a thrust of 200KN/m. Determine the torque, the axial and rotational inflow factors, and efficiency of the element.
9. Write down the types of maneuvering test. Explain each test with the help of proper diagram.
10. Write down the types of captive model test. Explain each test with the help of diagram.
11. Write down the types of multihull ship. Explain each type of ship with schematic diagram.