INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)
Entrance Examination for Admission to Ph.D/ MS (By Research)

Subject Name: NAOE

Maximum Marks: 120
Time: 2 Hours

INSTRUCTIONS

1. Prior to the commencement of the examination, Candidate should check that this question paper does not have any unprinted or torn or missing pages or items, etc. If so, he has to get it replaced with a complete test booklet.

2. This Question Paper contains 120 questions. Each correct answer gets 1 mark. There correct answer gets 1 mark. There are no negative marks for wrong answers.

3. Candidate has to mark answers only in the OMR sheet provided. Follow the instructions given on the OMR sheet.

4. You have to bubble all your answer in Blue or Black Pen on the separate OMR Answer Sheet provided. See directions in the Answer Sheet.

5. More than one bubbled answer per question will make the question invalid for evaluation.

6. Please note that it is the candidate's responsibility to fill in the Roll Number carefully on the OMR sheet.

7. You have to enter your Roll Number in the Question Paper in the Box provided alongside.
DO NOT write anything else on the Test Booklet.

8. At the end of the examinations both OMR sheet and the Question booklet have to be handed over to the Invigilator.

9. Sheets for rough work are appended in the Question Paper at the end.

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Multiple Chcice questions in **General Aptitude** for Ph.D / M.S. (By Research)

1. The monthly incomes of X and Y are in the ratio of 4:3 and their monthly expenses are in the ratio of 3:2. However, each saves Rs. 6000/-per month. What is their total monthly income?

   (a) Rs. 28,000/-

   (b) Rs. 42,000/-

   (c) Rs. 56,000/-

   (d) Rs. 84,000/-

2. Suppose the average weight of 9 persons is 50 kg. The average weight of the first 5 persons is 45 kg, whereas the average weight of the last 5 persons is 55 kg. Then, the weight of the 5^{th} person will be

   (a) 45 kg

   (b) 47.5 kg

   (c) 50 kg

   (d) 52.5 kg

3. What is the value of x in the following logarithm equation?
   $\log(x+2) - \log(x- 1) = \log 2$

   (a) 5

   (b) 4

   (c) 3

   (d) 2

4. "Price is not the same thing as value. Suppose that on a day the price of everything viz., coal, bread, postage stamps, the taxi fare, the rent of houses etc. were to double. Prices then would certainly rise, but values of all things except one would not."

   The writer wants to say that if prices of all things were doubled,

(a) the values of all things would remain constant.

(b) the values of the things sold would be doubled.

(c) the values of all things bought would be halved.

(d) the values of money only would be halved.

5. During the last summer vacation, John went to a summer camp where he took part in hiking, swimming and boating.

This summer, he is looking forward to a music camp where he hopes to sing, dance and learn to play the guitar. Based on the above information, four conclusions as given below, have been made.

Which one of these logically follows from the information given above?

(a) John's parents want him to play the guitar.

(b) John prefers music to outdoor activities.

(c) John goes to some type of camp every summer.

(d) John likes to sing and dance.

6. The number of deaths among the army personnel is 8 in 1000, but among the civilian population, it is 20 per 100. Which of the following inferences can be drawn from this statement?

(a) It is better to join the army.
(b) The relationship is fortuitous.
(c) Quality of Life Index is very high within the armed forces.
(d) The groups can't be compared due to their heterogeneity.

7. A person walks 12 km due north, then 15 km due east, after that 19 km due west and then 15 km due south. How far is he from the starting point?

(a) 5 km

(b) 9 km

(c) 12 km

(d) 15 km

8. The sum of income of A and B is more than that of C and D taken together. The sum of income of A and C is the same as that of B and D taken together. Moreover, A earns half as much as the sum of the income of B and D, Whose income is the highest?

(a) A
(b) B
(c) C
(d) D

9. As per agreement with a bank, a businessman had to refund a loan in some equal installments without interest. After paying 18 installments he found that 60% of his loan was refunded. How many installments were there in the agreement?

(a) 22

(b) 24

(c) 30

(d) 32

10. A gardener increased the area of his rectangular garden by increasing its length by 40% and decreasing its width by 20%. The area of the new garden is

(a) has increased by 20%.

(b) has increased by 12%.

(c) has increased by 10%.

(d) remains exactly the same as the old area.

11. In a meeting, the map of a village was placed in such a manner that south-east becomes north, north-east becomes west and so on. What will south become?

(a) North.

(b) North-east.

(c) North-west.

(d) West.

12. Running at a speed of 60 km per hour, a train passed through a 1.5 km long tunnel in two minutes. What is the length of the train?

(a) 200 m.

(b) 300 m.

(c) 500 m.

(d) 800 m.

13. Aditya attempted 12 questions in the examination for Science paper and secured full marks in all of them. If he obtained 60% in the test and all the questions carried equal marks, then what is the number of questions in the test?

(a) 20.

(b) 22.

(c) 24.

(d) 30.

14. Lead, ingested or inhaled, is a health hazard. After the addition of lead to petrol has been banned, what still are the sources of lead poisoning?

1. Smelting unit.
2. Pens and pencils.
3. Paints.
4. Hair oils and cosmetics.

Select the correct answer from the choices given below?

(a) 1 and 3 only.

(b) 1, 2 and 3 only.

(c) 2 and 4 only.

(d) All of above (1, 2, 3 and 4).

15. Rainbow is produced when sunlight falls on drops of rain. Which of the following physical phenomenon are responsible for this?

1. Dispersion.
2. Refraction.
3. Internal reflection.

Select the correct answer from the choices given below?

(a) 1 and 2 only.

(b) 2 and 3 only.
(c) 1 and 3 only.
(d) All of above (1, 2 and 3).

16. The known forces of nature can be divided into four classes, viz. gravity, electromagnetism, weak nuclear forces and strong nuclear forces. With reference to them, which one of the following statements is not correct?
    (a) Gravity is the strongest of the four.
    (b) Electromagnetism acts only on particles with an electric charge.
    (c) Weak nuclear force causes radioactivity.
    (d) Strong nuclear force holds protons and neutrons inside the nucleus of an atom.

17. Acid rain is caused by the pollution of environment by:

    (a) Carbon dioxide and Nitrogen.

    (b) Carbon monoxide and Carbon dioxide.

    (c) Ozone and Carbon dioxide.

    (d) Nitrous oxide and Sulphur dioxide.

18. Salts of which of the following elements provide colour to the fireworks:

    (a). Zinc and Sulphur.

    (b). Potassium and Mercury.

    (c). Strontium and Barium.

    (d). Chromium and Nickel.

19. Which one of the following is the correct sequence of the given substances in the order of their densities?

    (a). Steel>Mercury>Gold

    (b). Gold >Mercury> Steel

    (c). Steel> Gold > Mercury

(d). Gold > Steel > Mercury

20. In addition to fingerprint scanning, which of the following can be used in the biometric identification of a person?

1. Iris scanning.
2. Retinal scanning.
3. Voice recognition.

Select the correct answer from the choices given below?

(a) 1 only.
(b) 2 and 3 only.
(c) 1 and 3 only.
(d) All of above (1, 2 and 3).

21. The principle on which Optical fibre works is:

(a) Total internal reflection.
(b) Scattering.
(c) Refraction.
(d) Interference.

22. Diffusion of light in the atmosphere takes place due to which of the following:

(a) Carbon dioxide.
(b) Dust particles.
(c) Helium.
(d) Water vapour.

23. Which of the following is/are the example(s) of chemical change?

1. Crystallization of sodium chloride.
2. Melting of ice.
3. Souring of milk.

Select the correct answer from the choices given below?

(a) 1 and 2 only.

(b) 3 only.

(c) None of above (1, 2 and 3).

(d) All of above (1, 2 and 3).

24. "If political leadership fails to emerge, there is likelihood of military taking over power in developing countries. Radical student groups or labour may try to raise revolution but they are not likely to compete with the military. Military intervention, rule, and withdrawal from politics is closely related to a society's level of political development"

In the context of political development, the assumption in the above passage is that

(a) Political leadership is not an effective instrument.

(b) Military fills in political vacuum.

(c) Military intervention is inevitable for political development.

(d) None of the above.

25. A military code writes SYSTEM as SYSMET and NEARER as AENRER. Using the same code, FRACTION can be written as:

(a) CARFTION

(b) FRACNOIT

(c) NOITCARF

(d) CARFNOIT

Maritime Sector

26. The head quarter of the international Maritime Organization is located

(a) Geneva
(b) New York
(c) London
(d) Washington

27. The International Maritime Organization is an UN body for regulating

(a) Cargo & defence ships
(b) Cargo & passenger ships
(c) Canals & ports
(d) Ships & ports

28. The largest Indian shipping company in the private sector is

(a) Great Eastern
(b) Shipping Corporation of India
(c) Essar
(d) Mercator

29. Merchant navy primarily covers

(a) Defence of the country
(b) Underwater exploration
(c) Carriage of goods & passengers
(d) Managing ports

30. Largest export from India in terms of volume is

(a) Tea

(b) Spices

(c) Iron Ore

(d)garments

31. Largest import to India in terms of volume is

(a) Crude Oil

(b) Grains

(c) Cement

(d)Fertilizer

32. Sagarmala is a significant project for

(a) Connecting Ports

(b) Improving infrastructure

(c) Improving logistics

(d)All of these

33. What is special about an Indian Team which recently circumnavigated the world in a sailing boat?

(a) All Girl team of 6 Indian Naval officers

(b) 03 male and 03 female Indian Naval officers

(c) All men team of 6 Indian Naval officers

(d) All Girl team of 6 Indian officers, 02 from Navy, 02 from Army and 02 from Air Force.

34. Who became the first Indian woman to receive IMO's Exceptional Bravery Award at Sea?

(a) Captain S. Nilkeni

(b) Captain Ruchika Malhotra

(c) Captain Monika Mehrotra

(d) Captain Radhika Menon

35. Panama Canal connects

(a) Atlantic Ocean & Mediterranean Sea

(b) Atlantic Ocean & Gulf of Mexico

(c) Pacific Ocean & Atlantic Ocean

(d) Mediterranean Sea & Red Sea

36. The continent through which all three imaginary lines, e.g. Equator, Tropic of Cancer and Tropic of Capricorn pass through is

(a) Africa

(b) Asia

(c) Europe

(d) Australia

37. First ship built in an Indian shipyard is

(a) Loyalty

(b) Rajendra

(c) Jal Usha

(d) Vikrant

38. The accident of Titanic led to the development of which international convention

(a) SOLAS

(b) loadline

(c) MARPOL

(d) STCW

39. Indian Maritime University has campuses in

(a) Chennai & Mumbai

(b) Chennai & Kolkata

(c) Chennai & Kochi

(d) All of these

40. For carrying cargo the ship owner earns

(a) Freight

(b) Demurrage

(c) Hire

(d) Dispatch

41. Bunkering is the process of

(a) Refueling the ship

(b) Loading the ship

(c) Unloading the ship

(d) Inspecting the ship

42. Rudder is used in ship for

(a) Moving the ship

(b) Turning the ship

(c) Increasing the ship's speed

(d) Stopping the ship

43. Sea water as ballast is used in ships for

(a) Maintaining stability of a ship

(b) when transmitting a distress message

(c) Cooling of the engines of a ship

(d) For converting to potable water

44. Main thrust for development and adoption of ISM Code came from the findings of accident involving

(a) The Herald of Free Enterprise

(b) Scandinavian Star

(c) Exxon Valdez

(d) Amoco Cadiz

45. The ISM Code is mandatory on ships and refers to the

(a) International Shipping Market

(b) International Seafarer's Management

(c) Inter Shipping Management

(d) International Safety Management

46. Master has the overriding authority and the responsibility to make decisions with respect to

(a) Pollution prevention

(b) Safety of the Ship

(c) Safety and Pollution prevention

(d) None of these

47. In a radio transmission from a ship 'Roger' means

(a) I understand you

(b) I agree with you

(c) I hear you

(d) I see you

48. 'Mayday' signal is used in shipping

(a) when there is more than one emergency

(b) when transmitting a distress message

(c) Greeting another passing ship

(d) Informing the authorities that all is well on board

49. The share of the Indian seafarers in the world is

(a) 15%

(b) 12%

(c) 5%
(d) 8%

50. Largest shipping company in the world is

(A) Maersk

(b) MSC

(c) Evergreen

(d) Mitsui OSK

51. The HQ of Directorate General of Shipping is located at

(a) Chennai

(b) New Delhi

(c) Kolkata

(d) Mumbai

52. Alang is famous for

(a) Largest Indian Port

(b) Ship Breaking

(c) Ship building

(d) Ship repairing

53. Anchor is used in ship for

(a) Keeping the ship in one place

(b) Securing the ship

(c) Tying the ship with shore

(d) Decorating the ship

54. Which of the following may be used as fuel in the engines of a ship

(a) High Speed Oil

(b) Furnace Oil

(c) Diesel Oil

(d) All of these

55. Iron ore is carried in

(a) Bulk carriers

(b) Oil Tankers

(c) Container ships

(d) General cargo ships

56. Computers are used on-board for

(a) Marine communication

(b) ship to shore communication

(c) shore to ship communication

(d) All of these

57. Which of the following are the types of ships

(a) RORO

(b) Reefer

(c) Heavy Lift

(d) All of these

58. Overall command of the ship is with Master who is the

(a) Ship Manager

(b) Chief Engineer

(c) Captain

(d) Harbour Master

59. The Indian Maritime University was established in

(a) 2009

(b) 2008

(c) 2010

(d) 2011

60. MS Act stand for

(a) Merchant Shipping Act

(b) Merchant Seamen Act

(c) Marine Surveyors' Act

(d) Maritime Shipping Act

Multiple Choice Questions in **Naval Architecture & Ocean Engineering**

Answer all questions. Each question carries 1 marks. Conventional ship fixed coordinate system shall be used wherever applicable (X: positive forward, Y: positive to starboard, Z: down towards water). Assume fresh water and sea water density as per convention.

61. The following holds true for block coefficient (C_B) of a vessel.

(a) $C_B \leq 1.0$	(c) $C_B = 1.0$
(b) $C_B > 1.0$	(d) None of the above

62. The girth till load water line is measured at several stations along the length of the ship. The integration of girth will give the following parameter:

(a) Midship section area	(c) Vessel's displacement
(b) Waterplane area	(d) Wetted surface area

63. The section area curve for a 8.0 m load water line is drawn. The integration of section area curve will give the following parameter for 8.0 m loadwater line:

(a) Midship section area	(c) Vessel's displacement
(b) Waterplane area	(d) Wetted surface area

64. A vessel is in the form of a triangular prism 32 m long, 8 m wide at the top and 5 m deep. KG = 3.7 m. The initial metacentric height when vessel is floating on an even keel at 4 m draft (forward and aft) is:

(a) $GM_T = 0.68$ m	(c) $GM_T = 0.12$ m
(b) $GM_T = 2.69$ m	(d) None of the above

65. A ship of 6000 metric tonnes displacement has $KM_T = 7.3$ m, KG = 6.7 m and is floating upright on an even keel. A weight of 60 metric tonnes already on board is shifted 12.0 m transversely. The resultant list will be.

(a) 16.89°	(c) 2.56°
(b) 11.31°	(d) None of the above

66. A ship 120 metres long at the waterline has equidistantly spaced half ordinates commencing from forward as follows: 0, 3.7, 5.9, 7.6, 7.5, 4.6, 0.1 meters, respectively. The area of the waterline and the TPC (Tonnes Per cm Immersion) at this draft are:

(a) 12.37 m^2, 1207 Metric Tonnes	(c) 25.25 m^2, 1806 Metric Tonnes
(b) 1207 m^2, 12.37 Metric Tonnes	(d) None of the above

67. Simpson's $\frac{3h}{8}\left(y_1 + 3y_2 + 3y_3 + y_4\right)$ integration rule assumes that the equation of the curve is of the form:

(a) $a_0 + a_1x + a_2x^2 + a_3x^3$	(c) $a_0 + a_1x$
(b) $a_0 + a_1x + a_2x^2$	(d) None of the above

68. The following relation holds true:

(a) Reynolds number = Inertial force/ Viscous force	(c) (a) and (b)
(b) Froude number = $\frac{V * L}{\nu}$	(d) None of the above

69. The following relation holds true:

(a) (Froude number)^2 = Inertial force/ Gravity force	(c) Froude number = Inertial force/ Gravity force
(b) Froude number = $\frac{V}{\sqrt{g * L}}$	(d) (a) and (b)

70. The following is true of a truss structure:

(a) The structural members only take axial force	(c) (a) and (b)
(b) The moment at the pin joints = 0	(d) None of the above

71. It is desired to apply high tensile steel to ship structure to reduce lightship weight and increase longitudinal strength. The preferable locations where the high tensile steel shall be used in midship section is:

(a) Deck structure (away from neutral axis)	(c) Near the neutral axis
(b) Bottom structure (away from neutral axis)	(d) (a) and (b)

72. A rectangular barge is floating in water in even keel. Two objects, each of them of mass m, are shifted away from midship towards the forward and aft end of the barge. There is no change in draft and trim of the vessel. The bending moment acting on the vessel will:

(a) Increase	(c) Insufficient information
(b) Decrease	(d) None of the above

73. In a LNG tanker spherical shaped independent cargo tanks are provided. Will the independent cargo tank's scantlings contribute to midship section modulus of the LNG carrier?

(a) Yes	(c) Insufficient information
(b) No	(d) None of the above

74. The following holds true for Type A and Type B freeboard in the context of load line regulations.

(a) Type A: Oil tanker, Type B: Container carrier	(c) Type A: Bulk Carrier, Type B: Oil tanker
(b) Type A: Oil tanker, Type B: Bulk Carrier	(d) (a) and (b)

75. All transverse and longitudinal bulkheads (watertight and oil tight) used for subdivision of the ship extend until this deck.

(a) Bulkhead deck	(c) (a) and (b)
(b) Freeboard deck	(d) None of the above

76. The term "Floodable length" is used in the context of:

(a) Ballast tank capacity	(c) Intact stability
(b) Cargo capacity	(d) Damage Stability

77. The purpose of slop tank in an oil tanker is:

(a) To store oil and water mixture after crude oil washing of the cargo tank	(c) To store diesel oil for onboard consumption
(b) To store fresh water for drinking purpose	(d) None of the above

78. A vessel's “minimum bow height” requirement is greater than the “freeboard”. The vessel’s operating requirements does not permit it to have sheer. What alterative design option is available for complying with loadline regulation?

(a) Provide a forecastle	(c) (a) and (b)
(b) Increase the vessel’s depth	(d) None of the above

79. The damage stability computation of a loaded oil tanker considers the following aspects:

(a) Oil pollution	(c) Oil shall be assumed to drain out of the damaged cargo tanks
(b) Cargo permeability	(d) (a), (b), and (c)

80. For a loaded double hull oil tanker, a damage situation where oil will not be released out in the sea.

(a) Only breach of outer hull	(c) (a) and (b)
(b) Not possible. All damage cases result in oil outflow.	(d) None of the above

81. The following is correct for Type A, Type B and Type C independent tanks in the context of liquefied gas carriers:

(a) Type A: LPG carrier, Type B; LNG carrier Type C: Pressure vessel	(c) Type A: LNG carrier, Type B; LPG carrier Type C: Pressure vessel
(b) Type A: Pressure vessel, Type B: LPG Carrier, Type C: LNG carrier	(d) None of the above

82. A pure car carrier has a weather tight foldable closing ramp installed on the side shell at the aft. The lowermost opening of the ramp will be above which deck?

(a) Bulkhead deck	(c) (a) and (b)
(b) Freeboard deck	(d) None of the above

83. For which type of ship the concept of "alternate hold loading" is employed?

(a) Bulk carrier	(c) Tug
(b) Passenger ship	(d) None of the above

84. What is sloshing? For which ship type this phenomenon is critical?

(a) Random and free motion of liquid inside tank. Oil tanker.	(c) Random and free motion of liquidified gas inside tank. Gas carrier.
(b) Random and free motion of bulk grain inside cargo hold. Bulk carrier.	(d) (a) and (c)

85. The inert gas is mandatorily used onboard the following ship types:

(a) Container carrier	(c) Passenger ships
(b) Oil tanker and gas carrier	(d) Tugs

86. The term "angle of repose" is relevant for which ship type and which ship structure?

(a) Bulk Carrier. Top side hopper tanks	(c) Oil tanker. Side shell plating.
(b) Bulk Carrier. Tank top plate	(d) Container ship. Engine room bulkhead

87. The terms “skew” and “rake” are used in the design of following item

(a) Tumblehome	(c) Bulbous bow
(b) Sheer strake	(d) Propeller

88. Name the two gases whose emissions are restricted from the ship as per MARPOL regulation.

(a) NO_x, SO_X	(c) N_2 and O_2
(b) N_2 and H_2	(d) None of the above

89. Grain stability rules are applicable for the following:

(a) While loading containers in a container ship	(c) While loading bulk grain in a bulk carrier
(b) While loading containers in a bulk carrier	(d) Passenger ship

90. The following requirements shall be satisfied by damaged GZ curve of a passenger ship.

(a) Minimum area under damaged GZ curve	(c) Minimum required range of damaged GZ curve
(b) Maximum permissible list after damage	(d) (a), (b) and (c)

91. A vessel has draft lines corresponding to Tropical (T): 23.96 m, Summer (S): 24.48 m, Winter (W): 25 m. If all the numeral values are correct, the following may be the correct draft combination:

(a) T: 23.96 m, S: 24.48 m, W: 25 m.	(c) W: 25 m, T: 24.48 m, S: 23.96 m.
(b) T: 25 m, S: 24.48 m, W: 23.96 m.	(d) None of the above

92. A vessel has a beam: 60 m, depth: 30 m and draft: 24 m. The double hull water ballast tank is 3.0 m wide on the side. A straight air pipe is at a height of 800 mm from the main deck. The air pipe permits water to enter tank when submerged. What will be the minimum down flooding angle for the vessel?

(a) 50.19°	(c) 4.56°
(b) 42.35°	(d) 14.13°

93. As per gas carrier ship regulation, the probability of exceeding permissible stress limit < 10^{-8} for acceptable structural design. The permissible stress for mild steel is 235 N/mm^2. There are two structural designs. In (a) Probability (stress $\geq$ 245 N/mm^2) = $10^{-7.8}$, and in (b) Probability (stress $\geq$ 235 N/mm^2) = $10^{-9.2}$. Which one of the design is acceptable?

(a) Only (b)	(c) Both (a) and (b)
(b) None of (a) and (b)	(d) Only (a)

94. An offshore supply vessel has very low freeboard in its working deck and a buoyant superstructure at the forward. The working deck gets immersed in water for low heel angles. The GZ curve is computed with "free to sink and trim" and "fixed trim" condition. Which one of the GZ curve you will use for designing the vessel.

(a) (b), (c) and (d)	(c) GZ curve computed with "fixed trim"
(b) Both GZ curves will be same	(d) GZ curve computed with "free to sink and trim"

95. As per gas carrier ship regulation, the empty independent tanks must be designed to endure antifloating arrangement. Antifloating arrangement means:

(a) Buoyant force on independent tank > Weight of independent tank	(c) (a) and (b)
(b) Buoyant force on independent tank < Weight of independent tank	(d) None of the above

96. As per MARPOL Crude Oil washing system needs to be provided for the following ship type:

(a) Oil tanker	(c) Tug
(b) Container ship	(d) None of the above

97. The steering gear can turn a rudder from -35° to + 30° in 28 seconds. During Zigzag test (20°/ 20°) the time taken for moving rudder from -20° to +20° will be ------ secs.

(a) 17.23	(c) 14.56
(b) 21.32	(d) None of the above

98. During a 20° / 20° Zigzag test, the ship's initial heading angle was 150°. The first -20° rudder angle command would be executed when the ship's heading angle was -----.

(a) 170°	(c) -170°
(b) 130°	(d) None of the above

99. During a -10° / -10° Zigzag test, the ship's initial heading angle was 135°. The first +10° rudder angle command would have been given when the ship's heading angle was -----.

(a) 115°	(c) 135°
(b) 155°	(d) 125°

100. During a starboard turning circle test, the ship's initial heading angle was 270°. The transverse displacement of the ship (from its initial position) when its heading angle first becomes ---------- (degrees) is called ----------.

(a) 0°, Transfer	(c) (a) and (b)
(b) 270°, Tactical diameter	(d) None of the above

101.A fighter jet is speeding on the flight deck of an aircraft carrier (in X axis direction of the ship) at a constant speed of 150 km/hour. The ship is steadily yawing to port side at 5° / sec. The magnitude of Coriolis acceleration acting on the fighter jet is -------- ? Please ignore all other dynamical effects.

(a) 7.272 m/s^2	(c) 7.8 m/s
(b) 9.8 m/s^2	(d) None of the above

102.The Euler angles used in ship dynamics are orthogonal.

(a) Commutative and orthogonal	(c) Yes
(b) No	(d) None of the above

103. During a sway harmonic test, 3 complete oscillation cycles are required. The carriage is towed at a steady forward speed of 4.0 m/s. The time period of one complete sway oscillation is 10 sec. The minimum tank length required will be ------ m.

(a) 40	(c) 80
(b) 120	(d) None of the above

104. In the 6 DoF motion of the ship, which degrees of freedom have the stiffness or restoring term present?

(a) Roll	(c) Heave
(b) Pitch	(d) (a), (b) and (c)

105. The following procedure will be followed during crash stop maneuver execution in a ship fitted with (i) fixed pitch propeller (ii) controllable pitch propeller.

(a) (i) Stop and reverse main engine (ii) Only reverse the propeller pitch	(c) (i) Give full ahead rpm (ii) Give full ahead rpm
(b) (i) Stop and reverse main engine (ii) Stop and reverse main engine, thereafter reverse the propeller pitch	(d) None of the above

106. The following parameters are measured during crash stop maneuver execution in a ship

(a) Stopping Ability	(c) Track Reach
(b) Head Reach	(d) All of the above

107. The instrument used for measuring heading angle and which does not depend on Earth's magnetic field is called -----.

(a) Gyrocompass	(c) Tachometer
(b) Magnetic compass	(d) Speedometer

108. Explain why a conventional merchant ship heels when the rudder angle is given. Does the direction of heel angle change as the ship's sway + yaw dynamics build up.

(a) Roll moment is induced because rudder is offset from ship's vertical centre of gravity. Yes	(c) Incorrect statement
(b) Pitch moment is induced because rudder is offset from ship's vertical centre of gravity. No	(d) (a) and (b)

109. For a moving ship rudder is more effective at the --------- of a ship.

(a) Forward	(c) Aft
(b) Pitch	(d) (a) and (b)

110. During a sway harmonic test, the hydrodynamic sway force and the ship speed are measured. Assume sway force and sway motion as $Y_H = Y_{\dot{v}} * \dot{v} + Y_v * v + Y_{vvv} * (v)^3$ and y (in meters) = $A * \sin\left(\frac{2\pi}{T} t\right)$ respectively. The carriage moves ahead at uniform speed u during the test. To determine $Y_{\dot{v}}$, Y_v and Y_{vvv} following analysis is required:

(a) Conformal mapping	(c) Broaching
(b) Impulse response analysis	(d) Fourier analysis

111. For the ship rolling motion equation: $\left(I'_{xx} + A'_{44}\right)\ddot{\phi}' + b'_{44}\dot{\phi}' + C'_{44}\phi = 0$

(a) A'_{44}: Added mass moment of inertia in the	(c) C'_{44} : Restoring

roll axis direction	moment coefficient
(b) b'_{44}: roll damping	(d) (a), (b) and (c)

112. To transform the body fixed dynamics of a surface ship u, v and r (surge speed, sway speed and yawing rate) to the NED (North East Down) coordinate system the following parameter is required:

(a) Roll angle	(c) Heading angle
(b) Pitch angle	(d) None of the above

113. A towing carriage is travelling at 4.0 m/s and has wheels of diameter 1000 mm. Assume no slipping of wheel occurs. Determine the angular velocity of the wheels.

a. 76.4 rpm	c. 716.2 rpm
b. 358.9 rpm	d. 25 rpm

114. During propeller open water test, it is necessary to measure the following:

a. Tow force on the open water boat	c. Towing speed
b. Propeller Thrust	d. (b) and (c)

115. A 5 bladed overlapping propeller is kept on a table with its face pointing up. Its outline is then drawn on the table. The resulting shape will be the ---------- of the blade.

a. Developed area	c. Projected area
b. Expanded area	d. None of the above

116. The propeller open water efficiency (η_O) is defined as follows:

a. $\frac{T_O * V_A}{2\pi n Q_O}$	c. $\frac{2\pi K_{QO}}{K_{TO} * J}$

b. $\frac{K_{TO} * J}{2\pi K_{QO}}$	d. (a) and (b)

117. Following parameter can be varied for a controllable pitch propeller:

a. Propeller pitch	c. Propeller diameter
b. Propeller chord	d. (a), (b) and (c)

118. Following parameter can be varied in a fixed pitch propeller:

a. Propeller pitch	c. Propeller diameter
b. Propeller chord	d. None of the above

119. For computing propeller mass and the mass moment of inertia about the rotation axis, following parameters are essential:

a. Section area of the propeller blade	c. Propeller rpm
b. Propeller power	d. None of the above

120. The following is one of the design criteria for preventing forward bottom slamming:

a. Waterplane area	c. Midship section area
b. Yield stress of mild steel	d. Minimum draft