

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

Subject Name: **Naval Architecture & Ocean Engineering** Maximum Marks: **120**

Date: **19.01.2019**

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.
8. DO NOT write anything else on the Test Booklet.
9. At the end of the examinations both OMR sheet and the Question booklet have to be handed over to the Invigilator.
10. Sheets for rough work are appended in the Question Paper at the end.
11. Essay Test Question is mentioned at the end of this Question Paper.

Note: Only one out of four answers is correct. Please read all the alternatives before answering.

1. A day is celebrated as the National Maritime Day in our country. This is in remembrance of which significant event?
 - a. Building of the first Indian Ship
 - b. Arrival of the first Indian ship in London
 - c. Establishment of the first Indian shipping company
 - d. Sailing of first Indian ship

2. In the absence of international shipping
 - a. Half the world would freeze
 - b. Half the world would starve
 - c. Nothing will happen
 - d. Half the world would starve and the other would freeze

3. Which is the largest Indian ship owning company?
 - a. Essar Shipping
 - b. Great Eastern Shipping
 - c. Shipping Corporation of India
 - d. Shreyes Shipping

4. Which country supplies maximum seafarers to the global shipping industry?
 - a. India
 - b. Philippines
 - c. China
 - d. Russia

5. Cargoes while loading on ships may be in following condition?
 - a. Packed
 - b. Loose
 - c. Inliquid form
 - d. All of these

6. Which port city is famous for ship scrapping?
 - a. Kolkata
 - b. Bhavnagar
 - c. Vizag
 - d. Mumbai

7. Ships are made of which main material?
 - a. Steel
 - b. Wood
 - c. Alloys
 - d. Composites

8. Which of these is important for the navigation of a ship while near the coast?
 - a. Tide
 - b. Current
 - c. Wind
 - d. All of these

9. Which of these would be in the functions of the Director General of Shipping?
 - a. Registry of ships
 - b. All of these
 - c. Certification of seafarers
 - d. Implementation of MS Act on Indian Ships

10. The Indian legislation for commercial ships is called?
 - a. Marine Insurance Act
 - b. Merchant Shipping Act
 - c. Admiralty Act
 - d. Maritime Shipping Act

11. Territorial waters of India extend to what distance from baseline?
 - a. 10 Nautical miles
 - b. 15 Nautical miles
 - c. 12 Nautical miles
 - d. 20 Nautical miles

12. Port of Kandla is situated in which state?
 - a. Gujarat
 - b. Maharashtra
 - c. Karnatak
 - d. West Bengal

13. If it is 4 p.m. in Chennai, time in London will be
 - a. Less than 4 pm
 - b. More than 4 pm
 - c. Noon
 - d. 4 am

14. Which system is used for navigating modern ships while in deep seas?
 - a. Star
 - b. Sun
 - c. Satellite
 - d. Moon

15. First modern Indian ship was built in s shipyard located in which city?
 - a. Mumbai
 - b. Visakhapatnam
 - c. Kochi
 - d. Chennai

16. Who is the only Indian who has headed the International Maritime Organization in London?
- Sumati Morarjee
 - C.P. Srivastava
 - Ramaswami Mudaliar
 - Ravi Mehrotra
17. In which city does the Indian Maritime University have two campuses?
- Chennai
 - Mumbai
 - Kolkata
 - Kochi
18. Programs at the Indian Maritime University leads to a qualification in which discipline?
- All of these
 - Marine Engineering
 - Nautical Science
 - Naval Architecture
19. Sinking of Titanic led to development of which international convention?
- MARPOL
 - STCW
 - SOLAS
 - LOADLINE
20. Movement of cargo from Chennai to Kochi by ship will be referred as?
- Inland Waterway Shipping
 - Coastal Shipping
 - Deepwater Shipping
 - None of these
21. Breach of cyber security on board ship can effect which activity of the ship
- Navigation
 - Communication
 - Machinery Operation
 - None of these
22. Protection of marine environment covers which of the following areas?
- Discharge of pollutants from ship
 - All of these
 - Type of paint of the hull of the ship
 - Type of exhaust gases from the engine of the ship

23. Current quality management standard for certification is?
- ISO 9001:2008
 - ISO 9001:2008
 - ISO 9001:2015
 - ISO 14001:2015
24. Quality management certification is based on the standards set by which international organization?
- International Organization for Standardization
 - International Standards Organization
 - International Safety Organization
 - International Standards Office
25. Ships travel from one place to another. What is done so that a national identity is provided to a commercial ship?
- Names of the ships are broadcasted
 - Ships are registered in a country
 - Ships of one country travel together
 - National identity is not required as the ships move in open seas
26. Which of these ships provide assistance to the oil fields in the sea?
- Container ships
 - Offshore supply ships
 - Chemical tankers
 - Bulk carriers
27. Cost of transportation per unit is minimum in which mode of transportation?
- Aircraft
 - Train
 - Ship
 - Truck
28. Considering the same size, which type of ship will be most expensive?
- Gas carrier
 - Oil tankers
 - Container Ships
 - Bulk Carriers
29. Motor cars are transported by which type of ships?
- Heavy lift ships
 - Supply ships
 - Ro-ro ships
 - Container ships

30. What does ship owner earn to carry cargo from one place to another?
- Freight
 - Fare
 - Hire
 - Demurrage
31. Which of these ships carry crude oil?
- VLVV
 - ULCC
 - Suexmax
 - All of these
32. Process of refueling the ship is called?
- Bunkering
 - Ballasting
 - Berthing
 - Maneuvering
33. What is the function of propeller on ship
- Cooling the engines
 - Turning the ship
 - Moving the ship
 - Ballasting the ship
34. Which fuel is used on board ships?
- Heavy Oil
 - All of these
 - High Speed Oil
 - Diesel oil
35. A ship without cargo requires ballast. What material is used for this?
- Aluminum ingots
 - Steel Pipes
 - All of these
 - Sea Water
36. Vishwas sold an item for Rs.7,200 and incurred a loss of 20 per cent. At what price should he have sold the item to have gained a profit of 20 per cent.
- Rs.10, 800
 - Rs.8,950
 - Rs.11,200
 - Cannot be determined

37. The average age of 20 students of a section is 12 years. The average age of 25 students of another section is 12 years. What is the average age of both the sections combined together?
- 11.5 years
 - 11 years
 - 11.75 years
 - 12 years
38. A man runs 3 km per hour in still water. If the river is running at 1 km per hour, it takes 45 minutes to row to a place and back. How far is the place?
- 5 kms
 - 4 kms
 - 3 kms
 - None of these
39. A person invested Rs.2 lakhs at 12 percentage per annum interest for one year. If he invests Rs.500 more, he is eligible for 13 percentage per annum interest. How much more interest he would receive if he would have accepted the second option?
- Rs.2065
 - Rs.2165
 - Rs.2155
 - Rs.2045
40. If a car takes 40 minutes to cover a distance of 34 kms, what is its speed per hour?
- 61 kms
 - 51 kms
 - 50 kms
 - 45 kms
41. What should come in place of the question mark (?) in the following number series? 2 5 11 23 47 ?
- 95
 - 93
 - 98
 - 94

42. In a class of 60 students, 40 per cent can speak only Hindi, 25 per cent can speak only English and rest of the students can speak both the languages. Total how many students can speak English?
- a) 32
 - b) 28
 - c) 36
 - d) 15
43. Which of the following is not a correct statement about Infrasound?
- a) Infrasound has a frequency lower than 5000 Hertz
 - b) Infrasound is produced/detected by elephants and whales
 - c) Infrasound can travel longer distances than high frequency sound waves
 - d) All the above are correct
44. Germany will partner with India to develop which cities as smart cities?
- a) Jaipur, Ahmedabad and Ludhiana
 - b) Kochi, Bhubaneswar and Coimbatore
 - c) Allahabad, Ajmer and Visakhapatnam
 - d) Kakinada, Sholapur and Udaipur
45. A device for measuring the depth of sea is called
- a) Altimeter
 - b) Fathometer
 - c) Hydrometer
 - d) Manometer
46. A motorboat, whose speed in 15 km/hr in still water goes 30 km downstream and comes back in a total of 4 hours 30 minutes. The speed of the stream (in km/hr) is:
- a) 4
 - b) 5
 - c) 6
 - d) 10
47. One-third of Rahul's savings in National Savings Certificate is equal to one-half of his savings in Public Provident Fund. If he has Rs.1,50,000 as total savings, how much has he saved in Public Provident Fund?
- a) Rs. 30,000
 - b) Rs. 50,000
 - c) Rs. 60,000
 - d) Rs. 90,000

48. In a mixture of 60 litres, the ratio of milk to water is 2:1. If this ratio is to be 1:2, then the quantity of water to be further added to the mixture is:
- a) 20 litres
 - b) 30 litres
 - c) 40 litres
 - d) 60 litres
49. Three times the first of three consecutive odd integers is 3 more than twice the third. The third integer is:
- a) 9
 - b) 11
 - c) 13
 - d) 15
50. The effective annual rate of interest corresponding to a nominal rate of 6% per annum payable half-yearly is:
- a) 6.06%
 - b) 6.09%
 - c) 6.12%
 - d) 6.15%
51. Two ships are sailing in the sea on the two sides of a lighthouse. The angle of elevation of the top of the lighthouse is observed from the ships are 30° and 45° respectively. If the lighthouse is 100 m high, the distance between the two ships is:
- a) 173 m
 - b) 200 m
 - c) 273 m
 - d) 300 m
52. Identify the odd man out of following set of numbers: 396, 462, 572, 427, 671, 264
- a) 396
 - b) 427
 - c) 671
 - d) 264
53. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?
- a) $\frac{1}{10}$
 - b) $\frac{2}{5}$
 - c) $\frac{2}{7}$
 - d) $\frac{5}{7}$

54. If $\log 2 = 0.3010$ and $\log 3 = 0.4771$, the value of $\log_5 (512)$ is:
- a) 2.870
 - b) 2.967
 - c) 3.876
 - d) 3.912
55. A pump can fill a tank with water in 2 hours. Because of a leak, it took $2\frac{1}{3}$ hours to fill the tank. The leak can drain all the water of the tank in:
- a) $4\frac{1}{3}$ hours
 - b) 7 hours
 - c) 8 hours
 - d) 14 hours
56. After the division of a number successively by 3, 4 and 7 the remainders obtained are 2, 1 and 4 respectively. What is the number?
- a) 80
 - b) 76
 - c) 41
 - d) 53
57. 6 men and 8 women can do as much work in a given time as 3 men and 13 women. The capacities of a man and a woman are in the ratio
- a) 3:8
 - b) 3:5
 - c) 5:3
 - d) 5:8
58. The gross income of a person is Rs.25,000. 20% of his income is exempted from income-tax and the rate of income tax is 5%. His net income in rupees is:
- a) 23,500
 - b) 24,000
 - c) 24,500
 - d) None of these
59. The profit earned after selling an article for Rs.1754/- is the same as loss incurred after selling the article for Rs 1492/-. What is the cost price of the article?
- a. Rs. 1523
 - b. Rs.1623
 - c. Rs.1689
 - d. Rs.3246

60. A tank is connected to pipes. One of those pipes can fill the tank in 15 minutes while the other can empty it in 10 minutes. If the tank is initially $\frac{3}{5}$ full and both pipes are simultaneously opened, how much time it will take to fill or empty the tank?
- 12 minutes
 - 15 minutes
 - 18 minutes
 - 10 minutes
61. The minimum initial metacentric height for any ship as per IMO rules should not be less than _____
- 0.25 m
 - 0.15 m
 - 0.20 m
 - 0.30 m
62. The ratio of metacentric heights of a submarine when submerged at 100 m below water surface; to that when moving near water surface with a finite draft is _____
- = 0
 - > 0
 - < 0
 - = 1
63. The mass of a ship without cargo, fuel, stores, water, crew, etc that a ship carries is known as _____
- Deadweight
 - Lightweight
 - Displacement
 - Tonnage
64. The free surface effect on the metacentre of ships is important when the tanks are
- 95% full
 - 5% full
 - 50% full
 - All of the above
65. The angle of loll is defined as when the _____
- GZ goes from negative to positive
 - GZ goes from positive to negative
 - GZ is maximum
 - Not related to GZ

66. What is inclining experiment is used to determine?
- LCG
 - VCG
 - TCG
 - LCF
67. For conventional ships state which of the following is true: C_p is the longitudinal prismatic coefficient, C_b is block coefficient and C_m is midship section coefficient
- $C_p > C_m > C_b$
 - $C_m > C_p > C_b$
 - $C_b = C_m \times C_p$
 - Both b & c
68. Which direction does the ship heel while taking a turn towards starboard?
- Initially starboard and then to port
 - Initially port and then to starboard
 - Towards starboard only
 - Towards port only
69. Flare of the bow is provided to _____
- Avoid collision of anchor with the hull
 - Increases deck dryness
 - Increase deck area
 - To host anchor windlass
70. Deadrise and tumblehome are reduction of cross section _____
- before and after midship respectively
 - after and before midship respectively
 - above and below water line respectively
 - below and above water line respectively
71. Squat of a vessel is highly possible in _____.
- shallow water and high Fr number
 - deep water and low Fr number
 - shallow water and low Fr number
 - deep water and high Fr number
72. When a ship is disturbed, which among the following equilibrium conditions is true?
- Surge leads to stable equilibrium
 - Sway leads to neutral equilibrium
 - Yaw may lead to unstable equilibrium
 - Heave leads to neutral equilibrium
73. Why displacement hulls have an upper limit of $Fr = 0.25$?

- a. Wave resistance increases drastically
 - b. Frictional resistance increases drastically
 - c. Stability of ship is lost
 - d. Propellers fails at $Fr > 0.25$
74. One of the two identical container ship running at same speed has a bulbous bow. State the true condition
- a. Both ships require same power
 - b. Ship without bulbous bow requires more power
 - c. Ship with bulbous bow requires more power
 - d. Stability of the ship with bulbous bow increases
75. $K_T =$
- a. $T/\rho N^2 D^4$
 - b. $T/\rho N^2 D^5$
 - c. $T/\rho^2 N D^4$
 - d. $T/\rho N D^5$
76. When does cavitation on a propeller occur?
- a. Local pressure $>$ Vapour pressure
 - b. Local pressure = Vapour pressure
 - c. Local pressure $<$ Vapour pressure
 - d. None of the above
77. Skew angle for propeller is provided to _____.
- a. increase cavitation
 - b. delay cavitation
 - c. increase thrust
 - d. reduce clearance
78. Ducted propellers are usually used to _____
- a. increase the efficiency of propeller at low speed
 - b. directs more flow to the propeller
 - c. increase the efficiency of propeller at high speed
 - d. both a & b
79. Which of the method cannot be used to mimick turbulence during resistance test in ship model?
- a. Net
 - b. Sand paper
 - c. Trip wire
 - d. Dyes
80. Open water propeller test is carried out in towing tank
- a. With the propeller attached to the ship hull

- b. With the propeller alone
- c. With the ship hull alone
- d. All the above in order

81. If ω is wave frequency, then oscillation frequency ω_e of ship with zero forward speed in head waves is

- a. $\omega_e > \omega$
- b. $\omega_e = \omega$
- c. $\omega_e = \omega = 0$
- d. $\omega_e < \omega$

82. Where is IMO headquarters located?

- a. Mumbai
- b. London
- c. New York
- d. Rotterdam

83. Which of the ship sizes cannot enter through both Suez Canal and Panama Canal?

- a. Panamax
- b. ULCC
- c. Suezmax
- d. Handimax

84. 1 knots = _____ km/hr

- a. 1.618
- b. 1.852
- c. 1.414
- d. 0.618

85. PMM tests can give only _____

- a. Velocity dependent derivatives Y_v & N_v
- b. Rotary derivatives Y_r & N_r
- c. Acceleration derivatives Y_u & N_u
- d. All of the above

86. Broaching of ships under waves happens due to _____

- a. ineffectiveness of bilge keel
- b. ineffectiveness of rudder
- c. ineffectiveness of propeller
- d. all of the above

87. The roll period of a 1:100 scale ship model is 2.5 s. What will be the roll period of the prototype ship? (ignoring scale effects)

- a. 12.5 s
- b. 25 s

- c. 125 s
- d. 250 s

88. Parametric rolling of ships in head seas is caused due to _____
- a. large variation in water-plane area along the ship length
 - b. large variation in metacentric height with time
 - c. length of ship is nearly the wavelength
 - d. all of the above
89. If the deck of a vessel has curved upward (convex), it is said to have _____.
- a. camber
 - b. flare
 - c. deadrise
 - d. tumblehome
90. At head wave with wavelength equal to 80% of length of ship, when the crest of the wave is at mid-ship, the ship will
- a. sag longitudinally
 - b. hog longitudinally
 - c. sag transversely and hog longitudinally
 - d. none of the above
91. Double hull design is typically used for
- a. Container ships
 - b. Bulk carriers
 - c. Oil tankers
 - d. General cargo
92. Purpose of A-brackets is to
- a. Support the stern tube
 - b. Support the shaft of propeller
 - c. Transfer the thrust from propeller to ship
 - d. None of the above
93. For analysis the ship girder is considered as:
- a. Simply supported beam
 - b. Floating beam
 - c. Cantilever beam
 - d. Not as a beam
94. Choose the most common approximation to the hull weight distribution in analysis for loaded ship
- a. 2/3 of weight follows buoyancy curve
 - b. 2/3 of weight follows trapezoidal distribution
 - c. 1/3 of weight follows buoyancy curve
 - d. Both (b) and (c)

95. What the ratio of Reynolds' number (Re) on plates of same length subjected to same velocity but in two different fluids of density ratio 1:2 and viscosity ratio 2:1?
- 2
 - 1.25
 - 1
 - 4
96. Bernoulli's Equation is valid for
- Rarefied flow
 - Unsteady and inviscid flow
 - Steady and inviscid flow
 - Steady and viscous flow
97. Two spheres of same diameter and weight are dropped separately in tanks of oils of same specific gravities but different viscosities. If T_1 (more viscous) and T_2 (less viscous) are time taken to touch bottom?
- $T_1 = T_2$
 - $T_1 > T_2$
 - $T_1 < T_2$
 - None of the above
98. The non-dimensional number related to inertia and gravity forces is called as
- Weber number
 - Froude number
 - Cauchy number
 - Reynolds' number
99. The absolute viscosity of fluid, μ is a function of _____ only.
- Density
 - Pressure
 - Temperature
 - Surface Tension
100. What is slip boundary condition if ' τ_w ' is shear stress at wall?
- $\tau_w = 0$
 - $\tau_w \neq 0$
 - $\tau_w = C$ where C is a constant
 - None of the above
101. For which condition does the streamline, streak line and path line become identical?
- Irrotational flow
 - Inviscid flow
 - Unsteady flow
 - Steady flow

102. Pressure less than atmospheric pressure is known as _____
- Gauge pressure
 - Vapour pressure
 - Vacuum pressure
 - Suction pressure
103. What is the condition for separation of attached flow around a curved wall, if 's' is the length along the wall and positive along the direction of flow & 'P' is the pressure adjacent to the wall?
- $\frac{\partial P}{\partial s} = 0$
 - $\frac{\partial P}{\partial s} < 0$
 - $\frac{\partial P}{\partial s} > 0$
 - None of the above
104. The resonance of a single degree of freedom damped system is said to occur when the _____
- Dynamic amplification factor is maximum
 - Phase angle between displacement and external force is 0°
 - Phase angle between displacement and external force is 90°
 - Phase angle between displacement and external force is 180°
105. Door dampers used for automatic door closing uses damping ratios, ζ typically _____
- $\zeta = 0$
 - $0 < \zeta < 1$
 - $\zeta = 1$
 - $\zeta > 1$
106. For a single degree of freedom undamped system the dynamic amplification factor at frequency ratio $r = 1$ is _____
- Zero
 - Unity
 - Infinite
 - None of the above
107. In a damped system, the ratio of the resonant amplitude to static amplitude is given by _____
- 2ζ
 - $2/\zeta$
 - $1/2\zeta$
 - $\zeta/2$
108. What does the Eigen values represent in a multi degree of freedom system?

- a. Natural frequencies
 - b. Number of participating modes
 - c. Mode shapes
 - d. None of the above
109. What is the dynamic amplification factor when frequency ratio is 1 and damping is zero?
- a. Zero
 - b. Unity
 - c. Infinite
 - d. None of the above
110. What is the displacement at nodes and antinodes respectively?
- a. Zero & non zero
 - b. Non zero & zero
 - c. Both non-zero
 - d. None of the above
111. Beating phenomenon is characterized by two frequencies acting on the system which are _____.
- a. Multiples of each other
 - b. Slightly different from each other
 - c. Largely different from each other
 - d. No relation exists
112. Given that water-depth to wavelength ratio is greater than 0.5, what is the wavelength when the time period is 10 s?
- a. 126 m
 - b. 156 m
 - c. 50 m
 - d. 15.6 m
113. Tsunamis have
- a. Shallow water wave characteristics
 - b. Deep water wave characteristics
 - c. Time period in seconds
 - d. Shorter wave lengths
114. What is the velocity of wind driven current at half the water depth?
Given: Speed at surface = 1 m/s, water depth = 10 m
- a. 0.5 m/s
 - b. 0 m/s
 - c. 0.9 m/s
 - d. 0.05 m/s
115. The wind velocity in calculation of wind loading on a structure is based on velocity at an elevation of _____

- a. 50 m
 - b. 15 m
 - c. 10 m
 - d. None
116. Stability of freely falling object is assured if its center of
- a. buoyancy lies below its center of gravity
 - b. gravity coincides with its center of buoyancy
 - c. gravity lies below metacentre
 - d. buoyancy lies below its metacenter
117. Consider a composite structure made of materials *a* and *b*, assumed to be composed wholly of material *a*. What should be the effective area of material *b*?
- a. $\frac{E_b}{E_a} A_b$
 - b. $\frac{E_a}{E_b} A_b$
 - c. $\frac{E_b}{E_a} A_a$
 - d. None of the above
118. What is the ratio of loading W_1/W_2 ? If, W_1 is a point load at the free end of a cantilever beam and W_2 is a point load at the centre of a simply supported beam. Assume, the material, cross-section, length and the deflections of both the beams are equal.
- a. 16
 - b. 0.0625
 - c. 0.625
 - d. None of the above
119. A steel bar of 5 mm is heated from 15° C to 40° C and it is free to expand. The bar Will induce
- a. no stress
 - b. shear stress
 - c. tensile stress
 - d. compressive stress
120. By Euler's buckling, what is the ratio of buckling load for column with both ends hinged to the buckling load of column with both ends fixed?
- a. 0.0625
 - b. 0.5
 - c. 0.25
 - d. None

ESSAY TEST

(One Hour)

Write an essay on the topic of your proposed research covering the following components in not less than 400 words:

- Objective
- Brief background
- Data requirement
- Methodology proposed