

CET, M. Tech. (NA & OE), 2020

Multiple Choice Questions

Subject: Naval Architecture

- 1) A uniform flow with a velocity of 2 m/s is flowing over a source placed at the origin. The stagnation point occurs at (-0.398, 0). Maximum width of Rankine half-body is:
 - a) 2.5 m
 - b) 2.2 m
 - c) 1.8 m
 - d) 4.0 m

- 2) What is the purpose of using expansion joints in super structure of ships?
 - a) Reduce bending stress of super structure deck
 - b) Reduce shear lag
 - c) Reduce thickness of super structure deck
 - d) Above statements, a) and c)

- 3) A fluid flow is given by $8x^3\vec{i} - 10x^2y\vec{j}$. Shear strain rate of the flow is:
 - a) $-10xy$
 - b) $-10y$
 - c) $8x^2y$
 - d) $12xy$

- 4) If h is ordinate spacing and y_1, y_2, y_3 and y_4 are ordinates, Simpson's $\frac{3h}{8}(y_1 + 3y_2 + 3y_3 + y_4)$ integration rule assume that the equation of the curve is of the form:
 - a) Cubic spline
 - b) Quadratic
 - c) Linear
 - d) Logarithmic

- 5) A sub-marine which may be supposed to approximate a cylinder 4 m in diameter and 20 m long travels submerged at 1.3 m/s in sea-water. Find the drag exerted on it, if the drag coefficient for Reynold number greater than 105 may be taken as 0.75. The density of seawater is given as 1035 kg/m³ and kinematic viscosity as 0.015 stokes.
 - a) 66353.8 N
 - b) 52474.5 N
 - c) 58635.5 N
 - d) 43666.2 N

- 6) The wave height characteristics from wave records are as shown in the following table. What is the significant wave height?

Wave height in Meter ①	Number of waves having height of "①" ②
0.3	4
0.61	40
0.91	31
1.22	25
1.52	2

- a) 1.51 m
b) 2.01 m
c) 1.11 m
d) 1.17 m
- 7) The probability density functions of the load and strength of an axially loaded structural member are given as " $S_X(x)$ " and " $R_X(x)$ " respectively.

$$S_X(x) = \frac{1}{12 - 6} \quad 6 \text{ ton} \leq x \leq 12 \text{ ton}$$

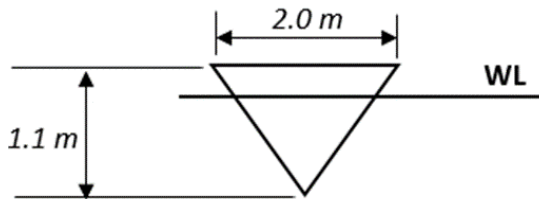
$$R_X(x) = \frac{1}{15 - 11} \quad 11 \text{ ton} \leq x \leq 15 \text{ ton}$$

What is the reliability of the structural member?

- a) 0.98
b) 0.91
c) 0.12
d) 0.22
- 8) As per MARPOL crude oil washing system needs to be provided for following ship type:
a) Oil tanker
b) Tug
c) Dredger
d) None of the above
- 9) In longitudinal strength calculation, hull girder is treated as a _____
a) Simply supported beam
b) Cantilever beam
c) Free-Free beam
d) Slender column
- 10) What is sloshing? For which ship type this phenomenon is critical?
a) Random and free motion of liquid inside tank, Oil tanker
b) Random and free motion of liquified gas inside tank, Gas Carrier
c) Random and free motion of bulk grain inside cargo hold, Bulk carrier
d) Above statements, a) and b)

- 11) A vessel's "minimum bow height" requirement is greater than the "freeboard". The vessel's operating requirements does not permit to have sheer. What alternative design option is available for complying with load line regulation.
- Provide a forecastle
 - Increase the vessel's depth
 - Above statements, a) and b)
 - Proved bilge keel
- 12) What is IACS?
- Classification Society
 - Association of Seafarers
 - Flag state
 - None of the above
- 13) For a merchant ship in trim by aft condition, where is the position of Longitudinal Center of Gravity (LCG) with respect to Longitudinal Center of Buoyancy (LCB)?
- $LCG < LCB$
 - $LCG > LCB$
 - $LCG = LCB$
 - $LCG \leq LCB$
- 14) What is the relation between Length by Breadth (L/B ratio) and speed (V) in conventional ship types?
- V increases with increase in L/B ratio.
 - V decreases with increase in L/B ratio.
 - Relation between V and L/B ratio is irrelevant.
 - None of the above
- 15) Slamming loads act on which area of the ship' hull?
- Midship area
 - Bilge area
 - Stem and Stern areas
 - Bottom and Bow flare areas
- 16) What is the numerical value of fluid velocity at stagnation point of plaining hull?
- 0.5 N/mm^2
 - 0.0 N/mm^2
 - 1.0 N/mm^2
 - -1.0 N/mm^2
- 17) _____ is useful in deciding the subdivision of ships.
- Resistance calculation
 - Floodable length calculation
 - Bonjean Calculation
 - Hydrostatics calculation

- 18) A body with uniform cross-section is floating in trim by forward condition in sea water. Cross-section of the floating body is as given in Fig.1. Length, Draught at aft end (T_{aft}) and Draught at forward end (T_{fwd}) of the body are 25 m, 0.75 m and 0.85 m respectively.



What is the value of buoyancy distribution in the aft end of the floating body?

- a) 0.435 t/m
 - b) 0.224 t/m
 - c) 0.335 t/m
 - d) 0.524 t/m
- 19) What is the change happens in the value of MCT 1cm when a vessel move from fresh water to sea water.
- a) Increases
 - b) Decreases
 - c) No change happens
 - d) Decreases by 2.5 %
- 20) What is the value of TPC in fresh water for a rectangular barge of “Length = 80 m, Breadth = 13 m, Draught = 0.7 m and Depth = 1.2 m”.
- a) 9.04
 - b) 10.40
 - c) 12.35
 - d) 10.20

- 21) The Displacement, LCG and VCG of a vessel is as follows:

Displacement = 434.688 t

LCG = 28.857m

VCG (solid) = 1.98 m

The hydrostatic table of the vessel is given below:

Draught (m)	Displacement (t)	VCB (m)	KM_T (m)
0.8	357.255	0.428	14.470
0.9	409.674	0.482	12.902
1.0	462.798	0.536	11.709

The total Free Surface Moment of all the internal tanks is 67.16 t m.

What is the transverse metacentric height of the vessel?

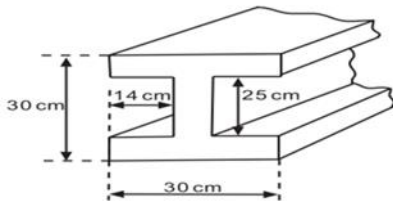
- a) 11.205 m
- b) 8.205 m
- c) 9.205 m
- d) 10.205 m

- 22) What is the value of block coefficient of a sphere of diameter 2 meter, when the sphere is floating at a draught of 1 meter?
- a) $\pi/3$
 - b) $\pi/4$
 - c) $\pi/5$
 - d) $\pi/6$
- 23) _____ is the product of prismatic coefficient and midship section area coefficient.
- a) Vertical Prismatic Coefficient
 - b) Water plane area coefficient
 - c) Block coefficient
 - d) Form Coefficient
- 24) _____ is not a high-speed craft.
- a) Hovercraft
 - b) Hydrofoil
 - c) Catamaran
 - d) Fishing vessel
- 25) _____ is service ship.
- a) General cargo ship
 - b) Tug
 - c) Fishing vessel
 - d) Container feeder vessel
- 26) Identify the major cause of stress concentration in ship structures?
- a) Concentrated load on deck
 - b) Uniform pressure acting on deck
 - c) Hydrostatic pressure acting on side shell
 - d) Hydrostatic pressure acting on bulkhead
- 27) A real fluid in which the shear stress is directly proportional to rate of shear strain (or velocity gradient) is called _____.
- a) Ideal fluid
 - b) Real fluid
 - c) Newtonian Fluid
 - d) Viscous fluid
- 28) An ideal fluid is considered as _____, inviscid and irrotational.
- a) Compressible
 - b) Incompressible
 - c) Viscous
 - d) Volatile

- 29) A two-dimensional potential flow is expressed as $\phi = \frac{x^5}{3} - xy^2 + \frac{x^3}{2} - \frac{y^2}{2}$. What is the flow velocity in y – direction?
- $x^2 - xy$
 - $-2xy - y$
 - $-2xy + y$
 - $y^2 - xy$
- 30) Sea surface elevation follow a _____ probability density function.
- Normal
 - Rayleigh
 - Lognormal
 - Weibull
- 31) Position of center of buoyance of vessel is at:
- Centroid of full cargo space
 - Centroid of underwater hull
 - Centre of gravity of all masses
 - Above statements, a) and b)
- 32) A random process for which temporal average is same as ensemble average is termed as _____.
- Stationary process
 - Ergodic process
 - Time dependent process
 - None of the above
- 33) The greatest breadth of the ship measure to the inside of the shell plating is known as _____.
- Moulded breadth
 - Extreme breadth
 - Breadth between perpendiculars
 - None of the above
- 34) What is the value of slope at the fixed end of a cantilever beam carrying a uniformly distributed load?
- 0 rad
 - 1 rad
 - 1 rad
 - 0.5 rad
- 35) The edge of the propeller which cuts the water first, when the ship is driven ahead is known as _____
- Face
 - Rake
 - Trailing edge
 - Leading edge

- 36) What are the commonly used shapes of side scuttles in ships?
- a) Rectangular and Circular
 - b) Triangular and Oval
 - c) Elliptical and Hexagonal
 - d) Circular and Oval
- 37) What is the electrode used in stud welding?
- a) Flux coated electrode
 - b) Tubular electrodes with flux inside
 - c) Stud itself
 - d) None of the above
- 38) For what purpose, a mangling machine is used in a shipyard?
- a) Cleaning plate
 - b) Bending plate
 - c) Straightening the plate
 - d) Painting the plate
- 39) Weld distortion can be reduced by:
- a) Use of gas welding
 - b) Applying shop primer
 - c) Following proper welding sequence
 - d) Reducing welding current
- 40) The term DFT is related to:
- a) Corrosion
 - b) Paint thickness
 - c) Gloss of painting
 - d) Marine growth on hull surface
- 41) What is the flight of an inclined ladder in a ship?
- a) Distance between rungs
 - b) Distance between the platforms
 - c) Actual stringer length
 - d) Distance between stringers
- 42) Why the frictional resistance increases when the draft increases?
- a) Deadweight of the vessel increases
 - b) C_B of the vessel increases
 - c) Wetted surface area increases
 - d) None of the above

43) Cross-section of a deck beam as shown in the following figure. What is the maximum stress in the beam if the bending moment at the middle of the beam is 15 t cm.

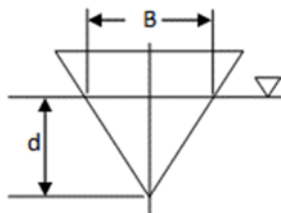


- a) 0.525 tonnes per square cm
- b) 0.625 tonnes per square cm
- c) 0.725 tonnes per square cm
- d) 0.825 tonnes per square cm

44) Which of the following is not a structural failure mode?

- a) Corrosion
- b) Buckling
- c) Yielding
- d) Fatigue

45) The KM of a floating body with the cross-section given in the figure is can be expressed as;



- a) $KM = (B^2/6d) + (2d/3)$
- b) $KM = (B^3/6d) + (2d/3)$
- c) $KM = (B^2/8d) + (2d/5)$
- d) $KM = (B^3/8d) + (2d/5)$

46) Where is Longitudinal Center of Flotation of a vessel?

- a) At longitudinal center of gravity of sectional area curve
- b) At longitudinal center of gravity of water plane
- c) At Aft perpendicular
- d) At Midship

47) Bowden's formula is used in estimation of

- a) Frictional resistance
- b) Wave resistance
- c) Roughness allowance
- d) Form factor

- 48) In shallow waters beyond critical speed, which type of waves will be emanating from the pressure point
- a) Only diverging waves
 - b) Only transverse waves
 - c) Both transverse & diverging waves
 - d) None of the above
- 49) The welded joint located between two plates in the same strake of hull plating is called as
- a) Butt
 - b) Lap
 - c) Seam
 - d) Bracket
- 50) A ship of displacement 59319 t has an effective power of 6600 kW at a speed of 15.9 knots. Estimate the effective power of a similar ship of displacement 64000 t at a speed of 16.5 knots.
- a) 6500 kW
 - b) 5580 kW
 - c) 7758 kW
 - d) 6040 kW
- 51) What is/are type(s) of blade section(s) employed in B-Series Propeller
- a) Aerofoil
 - b) Segmental
 - c) Aerofoil & Segmental
 - d) None of the above
- 52) Wake velocity arises due to
- a) Potential wake
 - b) Frictional wake
 - c) Wave wake
 - d) All the above
- 53) Cavitation at a particular location of the propeller indicates region of
- a) High pressure & high velocity
 - b) Low pressure & high velocity
 - c) High pressure & low velocity
 - d) Low pressure & low velocity
- 54) If cavitation number is _____, the efficiency of propeller falls?
- a) High
 - b) Positive
 - c) Low
 - d) Negative

- 55) For a blade section, $K_T = 0$ represents slip ratio = _____
- a) 100 %
 - b) 50 %
 - c) 10%
 - d) 0%
- 56) Kaplan series is adopted in _____ type of propellers.
- a) Surface piercing propellers
 - b) Ducted propellers
 - c) Contra-rotating propellers
 - d) Super-cavitating propellers
- 57) Identify a non-dimensional geometrical parameter of a propeller
- a) h/D
 - b) V/nD
 - c) P/D
 - d) s/D
- 58) Choose the correct condition for an under-damped system
- a) $v^2 = \omega^2$
 - b) $v^2 < \omega^2$
 - c) $v^2 > \omega^2$
 - d) None of the above
- 59) Seakeeping Performance Index – I may be classified as
- a) Mission effectiveness
 - b) Speed effectiveness
 - c) Transit Time Index
 - d) None of the above.
- 60) Over-balanced rudder represents that the centre of pressure of the rudder geometry is
- a) Aft of rudder stock axis
 - b) Forward of rudder stock axis
 - c) Lies on the rudder stock axis
 - d) None of the above
- 61) Identify the hydrodynamics derivative that cannot be determined using a rotating arm model test
- a) Y_v
 - b) Y_r
 - c) N_r
 - d) $Y_{\dot{v}}$

- 62) As per IMO standards, for all ships of length 100m should not have tactical diameter more than (L: Length of the ship)
- a) 5L
 - b) 4.5L
 - c) 2.5L
 - d) 6L
- 63) Identify the manoeuvring devices other than rudders
- a) Bow/stern thrusters
 - b) Twin screw propellers
 - c) Waterjet propulsion system
 - d) All of the above
- 64) Which of the following pre-painting surface preparation method is considered most efficient in case of hulls of modern-day ships?
- a) Pickling
 - b) Wire brushing
 - c) Blast cleaning
 - d) None of the above
- 65) Which of the following types of ships are assigned minimum freeboard?
- a) Bulk carriers
 - b) Car carriers
 - c) Oil Tankers
 - d) Container ships
- 66) Position of center of buoyancy for a box shaped barge floating in even keel condition.
- a) Half of ship draught
 - b) Half of ship depth
 - c) One fourth of ship depth
 - d) None of the above
- 67) Vertical support member used to strengthen bulkheads are called
- a) Spurling pipe
 - b) Stanchions
 - c) Rungs
 - d) Stiffeners
- 68) Which of the following is correct for a cargo ship?
- a) Dead weight = Displacement – Light weight
 - b) Dead weight = Displacement + Light weight
 - c) Displacement = $L_{BP} \cdot B \cdot T \cdot C_B$
 - d) Above statements, a) and c)

- 69) The purpose of providing camber is to:
- a) Strengthen main deck
 - b) Improve the appearance of the ship
 - c) Help drain off water from deck easily
 - d) None of the above
- 70) Morison's equation may be applied when
- a) $D/L < 0.2$
 - b) $D/L < 0.3$
 - c) $D/L = 0.2$
 - d) $D/L = 0.3$
- 71) A ship has a half circular cross section with breadth equal to diameter and draught equal to radius. Which of the following values will be its midship area coefficient?
- a) π
 - b) $\pi/4$
 - c) 2π
 - d) None of the above
- 72) The sectional area curve of a ship is triangular with the maximum ordinate being at midship. What is the prismatic coefficient?
- a) 0.65
 - b) 0.6
 - c) 0.55
 - d) 0.5
- 73) Identify a principal measure of a Z-manoeuvre.
- a) Speed
 - b) Resistance
 - c) Rudder deflection rate
 - d) Overshoot angle
- 74) When flooding occurs in a damaged vessel, reserve buoyancy _____.
- a) Increases
 - b) Decreases
 - c) Remains the same
 - d) None of the above
- 75) The purpose of bilge keels is to _____.
- a) Lower the center of gravity of the ship
 - b) Reduce the amplitude of roll
 - c) Reduce pitching
 - d) Reduce yawing

- 76) If a vessel loses its reserve buoyancy, it will
- Capsize and float on its side
 - Remain unaffected if the hull remains intact
 - Most likely sink
 - Float upright with the main deck awash
- 77) Hull-Model relation is based on:
- Reynolds numbers of both Hull and Model are equal.
 - Froude numbers of both Hull and Model are equal
 - Reynolds and Froude numbers of both Hull and Model are equal
 - None of the above
- 78) The purpose of the vessel inclining experiment is to
- Determine the location of the metacenter
 - Determine the lightweight center of gravity location
 - Verify the hydrostatic data
 - Verify data in the vessel's operating manual
- 79) A towing carriage is travelling at 4.0 m/s and has wheels of diameter 1000 mm. Assume no slipping of wheel occurs. What is the angular velocity of wheels?
- 76.4 rpm
 - 25.2 rpm
 - 358.6 rpm
 - 90.3 rpm
- 80) The fatigue load needs to be estimated corresponding to 10^8 wave encounters through the operating life of a ship. For shipbuilding steel, the S-N curve characteristics shall be available till:
- Number of cycles: 10^{12}
 - Number of cycles: 10^8
 - Number of cycles: 10^{16}
 - Number of cycles: 10^4