ENGLISH

I: Complete the sentences

1. The pilot was _____ injured, he died within half an hour.
   A. seriously
   B. fatally
   C. fatefully
   D. vitally

2. The punch made the boxer _____ in pain.
   A. wince
   B. gape
   C. grumble
   D. fumble

3. Since one cannot read every book, one should be content with making a _____ selection.
   A. normal
   B. standard
   C. moderate
   D. judicious

II. In each of the following questions, out of the four alternatives, choose the one, which can be substituted for the given word/sentence

4. Music sung or played at night below a person's window
   A. serenade
   B. sonnet
   C. lyric
   D. primo

5. A government by the nobles
   A. Democracy
   B. Bureaucracy
   C. Autocracy
   D. Aristocracy

6. A man of lax moral
   A. Ruffian
   B. Licentious
   C. Pirate
   D. Vagabond

III. In the following sentences given below, a word is underlined. For each of the underlined word, 4 words are listed below each sentence. Choose the word nearest in meaning to the underlined word.

7. The boy gave a <u>vivid</u> description of all that happened.
   A. brilliant
   B. fresh
   C. explanatory
   D. picturesque

8. It is <u>compulsory</u> for all the students to join this tour.
   A. regular
   B. necessary
   C. dutiful
   D. obligatory

9. The teacher felt that the student lacked <u>discrimination</u> in the study of his data.
   A. imagination
   B. good taste
   C. good judgement
   D. objectivity

10. Self-reliance has been <u>adopted</u> as an important objective of economic planning in modern India.
    A. refused
    B. forsaken
    C. denied
    D. discarded

11. He was in a <u>dejected</u> mood.
    A. jubilant
    B. rejected
    C. irritable
    D. romantic

12. There was a marked <u>deterioration</u> in his condition.
    A. improvement
    B. revision
    C. reformation
    D. amendment

13. His pocket has been picked.
    A. They have his pocket picked.
    B. Picking has been done to his pocket.
    C. Picked has been his pocket.
    D. Someone has picked his pocket.

14. My uncle promised me a present.
    A. A present was promised by my uncle to me.
    B. I was promised a present by my uncle.
    C. I had been promised a present by my uncle.
    D. I was promised by my uncle a present.

15. Who is creating this mess?
    A. Who has created this mess?
    B. By whom has this mess been created?
    C. By whom this mess is being created?
    D. By whom is this mess being created?

16. A lion may be helped even by a little mouse.
    A. A little mouse may even help a lion.
    B. Even a little mouse may help a lion.
    C. A little mouse can even help a lion.
    D. Even a little mouse ought to help a lion.

VI. Please complete the sentences with suitable alternatives.

17. She expects that her son _____
    A. can return
    B. may return
    C. should return
    D. None of he above

18. All felt that he _____ a cheat.
    A. may be
    B. can be
    C. might be
    D. None of the above

19. She _____ alone as it was raining heavily.
    A. must not leave
    B. must not have left
    C. should not leave
    D. None of the above

20. You _____ obey your parents.
    A. should
    B. ought to
    C. must
    D. None of the above

MATHEMATICS

1. 2 marbles are drawn in succession from a box containing 10 red, 30 white, 20 blue and 15 orange marbles, with replacement being made after each drawing. The probability that the first drawn marble is red and second is white is:
   a. 0.06333
   b. 0.05333
   c. 0.02433
   d. 0.05666

2. If $L\{f(t)\} = \frac{e^{\frac{-1}{s}}}{s}$, then $L\{e^{-t}f(3t)\}$ is
   a. s
   b. s+1
   c. s-1
   d. s^2

3. The directional derivative of $f(x, y, z) = 4e^{2x-y+z}$ at the point (1, 1, -1) in the direction towards the point (-3, 5, 6) is
   a. $\frac{-20}{9}$
   b. $\frac{20}{9}$
   c. $\frac{9}{20}$
   d. $\frac{-9}{20}$

4. The integral equation $\int_0^\infty f(x)\sin xt\, dx = \begin{cases} 1, & 0 \le t < 1 \\ 2, & 1 \le t < 2 \\ 0, & t \ge 2 \end{cases}$ is

   a. $\frac{2}{\pi x}$ (1+cos x-2 cos2x)
   b. $\frac{2}{\pi x}$ (1-cos x+2 cos2x)
   c. $\frac{2}{\pi x}$ (cos x-2 cos2x)
   d. $\frac{2}{\pi x}$ (cos x-2 cos2x-1)

5. By dividing [0, 1] into 4 equal sub intervals, the value of $\int_0^1 \frac{dx}{1+x}$ (using trapezoidal rule) correct to 3 decimal places is:
   a. 0.693
   b. 0.694
   c. 0.697
   d. 0.699

6. If u = x²-y², x=2r-3s+4, y=-r+8s-5, then $\frac{\partial u}{\partial r}$ =
   a. 4x+2y
   b. 2x+4y
   c. 4x-2y
   d. 2x-4y

7. The total mass of the region in the cube $0 \le x \le 1, 0 \le y \le 1, 0 \le z \le 1$ with density at any point given by xyz is
   a. 1/8
   b. 2/3
   c. 5/7
   d. 3/2

8. Two circles x²+y²-4x+10y+20 = 0 and x²+y²+8x-6y-24 = 0
   a. Touch externally
   b. Touch internally
   c. Are orthogonal
   d. Are disjoint

9. If the vectors xi+j-2k, i+j+3k, 8i+5j are coplanar, then the value of x is
   a. -2
   b. 5
   c. 2
   d. -5

10. The Laplace transformation of the following function using second translation theorem: 4sin(t-3)u(t-3) is
   a. $e^{3s}\frac{4}{(s^2+1)}$
   b. $e^{3s}\frac{4}{(s^2-1)}$
   c. $e^{-3s}\frac{4}{(s^2+1)}$
   d. $e^{-3s}\frac{4}{(s^2-1)}$

11. The integral of $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx \, dy$ is

    a. $\frac{\pi}{2}$

    b. $\frac{\pi}{4}$

    c. $\frac{\pi}{8}$

    d. $\frac{\pi}{6}$

12. The $\int y^2 dx - 2x^2 \, dy$ along the parabola $y = x^2$ from (0, 0) to (2, 4) is

    a.   48/5

    b.   -48/5

    c.   8/5

    d.   48

13. If T: $R^3 \rightarrow R^3$ is given by T(x, y, z) = (x + y + z, y + z, z) for (x, y, z)$\in R^3$ then T^{-1}(x, y, z) is

    a.   (x - y, y - z, z - x)

    b.   (x, y - z, z - x)

    c.   (x - y, y −z, z)

    d.   (x + y, y + z, z)

14. If C is the midpoint of AB and P is a point outside AB, then

    a.   PA+PB=PC

    b.   PA+PB+PC=0

    c.   PA+PB=2PC

    d.   PA+PB+2PC=0

15. If A be a 3 x 3 matrix with Eigen values 1,-1,0 then the determinant of $I+A^{100}$ is

    a.   6

    b.   4

    c.   9

    d.   100

16. The radius of curvature for the curve $y=e^x$ at (0,1) is

    a. $\sqrt{2}$

    b. $2\sqrt{2}$

    c. $\frac{1}{\sqrt{2}}$

    d. $\frac{1}{2\sqrt{2}}$

17. The mean value of a sine wave over half a cycle is
    a.   0.318 x maximum value
    b.   0.707 x maximum value
    c.   Peak value
    d.   0.637 x maximum value

18. Regula Falsi method is used for
    a.   Solution of ordinary differential equation
    b.   Differential of a function
    c.   Integration of a function
    d.   Solution off an algebraic (or) transcendental equation

19. The order of the pole of $\frac{(e^x-1)}{z^4}$ is
    a.   3
    b.   1
    c.   2
    d.   4

20. If C is unit circle $|z|=1$ then $\int_c \bar{z} \, dz =$
    a.   0
    b.   1
    c. $2\pi i$
    d. $4\pi i$

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 $8xx^3\vec{\iota} - 10xx^2yy\vec{\jmath}$. Shear strain rate of the flow is:
   a) $-10xxyy$
   b) $-10yy$
   c) $8xx^2yy$
   d) $12xxyy$

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.

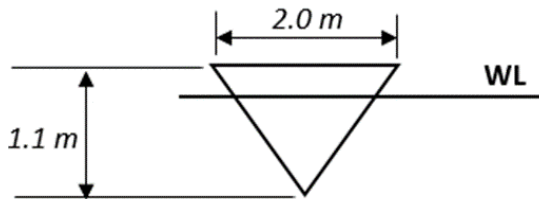$$S_X(x) = \frac{1}{12 - 6} \qquad 6\ ton\ \leq x \leq 12\ ton$$

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

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.
   a) Provide a forecastle
   b) Increase the vessel's depth
   c) Above statements, a) and b)
   d) Proved bilge keel

12) What is IACS?
   a) Classification Society
   b) Association of Seafarers
   c) Flag state
   d) 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)?
   a) LCG < LCB
   b) LCG > LCB
   c) LCG = LCB
   d) LCG <= LCB

14) What is the relation between Length by Breadth (L/B ratio) and speed (V) in conventional ship types?
   a) V increases with increase in L/B ratio.
   b) V decreases with increase in L/B ratio.
   c) Relation between V and L/B ratio is irrelevant.
   d) None of the above

15) Slamming loads act on which area of the ship' hull?
   a) Midship area
   b) Bilge area
   c) Stem and Stern areas
   d) Bottom and Bow flare areas

16) What is the numerical value of fluid velocity at stagnation point of plaining hull?
   a) 0.5 N/mm^2
   b) 0.0 N/mm^2
   c) 1.0 N/mm^2
   d) -1.0 N/mm^2

17) _____is useful in deciding the subdivision of ships.
   a) Resistance calculation
   b) Floodable length calculation
   c) Bonjean Calculation
   d) 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.

2.0 m

WL

1.1 m

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.
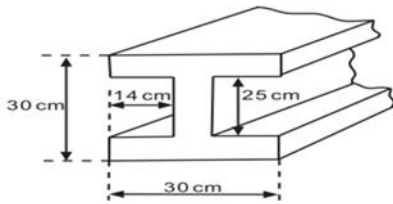What is the transverse metacentric height of the vessel?
- a) 11.205 m
- b) 8.205 m
- c) 9.205 m
- d) 10.205 m

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 are a 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?
   a) $x^2 - xy$
   b) $-2xy - y$
   c) $-2xy + y$
   d) $y^2 - xy$

30) Sea surface elevation follow a _____probability density function.
   a) Normal
   b) Rayleigh
   c) Lognormal
   d) Weibull

31) Position of center of buoyance of vessel is at:
   a) Centroid of full cargo space
   b) Centroid of underwater hull
   c) Centre of gravity of all masses
   d) Above statements, a) and b)

32) A random process for which temporal average is same as ensemble average is termed as _____.
   a) Stationary process
   b) Ergodic process
   c) Time dependent process
   d) None of the above

33) The greatest breadth of the ship measure to the inside of the shell plating is known as_____.
   a) Moulded breadth
   b) Extreme breadth
   c) Breadth between perpendiculars
   d) None of the above

34) What is the value of slope at the fixed end of a cantilever beam carrying a uniformly distributed load?
   a) 0 rad
   b) -1 rad
   c) 1 rad
   d) 0.5 rad

35) The edge of the propeller which cuts the water first, when the ship is driven ahead is known as _____
   a) Face
   b) Rake
   c) Trailing edge
   d) 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.
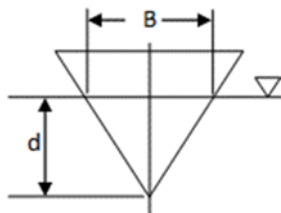

a) 0.525 tonnes per square cm
b) 0.625 tonnes per square cm
c) 0.725 tonnes per square cm
d) 0.825 tonnes per square cm

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, KT = 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) Yv
   b) Yr
   c) Nr
   d) Yv̇

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 proplusion 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 = $L_{BP} . B . T . C_B$
    d) Above statements, a) and c)

69) The purpose of providing camber is to:
   a) Strength 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
   a) Capsize and float on its side
   b) Remain unaffected if the hull remains intact
   c) Most likely sink
   d) Float upright with the main deck awash

77) Hull-Model relation is based on:
   a) Reynolds numbers of both Hull and Model are equal.
   b) Froude numbers of both Hull and Model are equal
   c) Reynolds and Froude numbers of both Hull and Model are equal
   d) None of the above

78) The purpose of the vessel inclining experiment is to
   a) Determine the location of the metacenter
   b) Determine the lightweight center of gravity location
   c) Verify the hydrostatic data
   d) 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?
   a) 76.4 rpm
   b) 25.2 rpm
   c) 358.6 rpm
   d) 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:
   a) Number of cycles: 10^{12}
   b) Number of cycles: 10^8
   c) Number of cycles: 10^{16}
   d) Number of cycles: 10^4