Q1] Mention the principle particulars of INS Vikrant?

→

Displacement = 40,000 tonnes

Length = 262 m

Beam = 62 m

Draft = 8.4 m

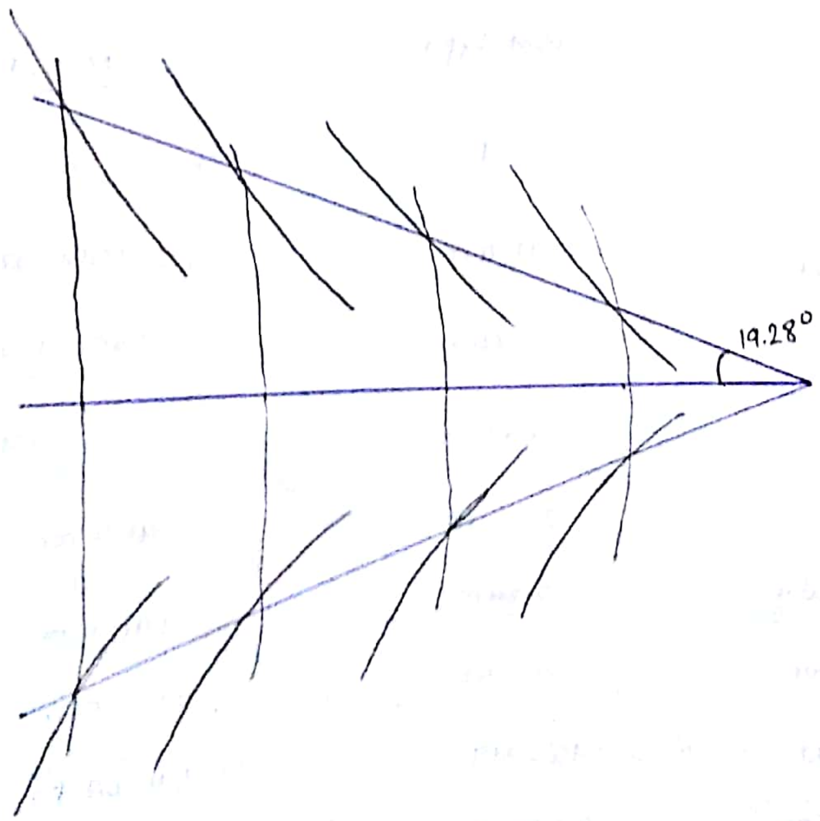
Depth = 25.6 m

Speed = 28 knots

Two shaft propulsion

4 gas turbines ⇒ 80 MW (110,000 hp)

Q2] Draw the ship wave pattern for high speed



KELVIN WAVE PATTERN

Q3]

b) ~~Ashok Leyland Fishing~~ Island. vessel

Particulars	Prototype	Model
Scale	1	5
LOA	11.58m	2.316 m
LWL	11.51m	2.302 m
Breadth	3.08m	0.616 m
Design Draft	0.8 m	0.16 m
Displacement	7.8 ~~ton~~	62.4 kg
Max Speed	8 knots	1.84 m/s

Froude no. - 0.381

c] Mahindra 20m medium craft

Particulars	Prototype	Model
Scale	1	6
Length of hull	11.4m	1900 mm
LWL	10.84 m	1806.7 mm
Beam	3.71 m	618.3 mm
Depth	2.7 m	450 mm
Draft hull body.	0.84m	140 mm
Draft maximum	1.39 m	232 mm
Displacement	12 MT	54.09 kg
Wetted area	34.19 m^2	0.95 m^2
Speed	12 knots	2.52 m/s

Q4] Resistance test : 290m ferry craft.

LOA = 2.978

B = 0.627

D = 0.269

T = 0.122

Δ = 112.76 kg.

S_m = 1.737 m^2

Scale : (15.9 : 1)

at V_s = 10 knots, R_{Tm} = 10.8 N $\qquad V_m$ = 1.29 m/s

$$C_{Tm} = \frac{10.8}{\frac{1}{2}\rho} \qquad C_{Tm} = \frac{R_{Tm}}{\frac{1}{2}\rho V^2 S_m} = \frac{10.8}{\frac{1}{2} \times 997 \times \left(\frac{10 \times 0.5144}{\sqrt{13.9}}\right)^2 \times 1.737}$$

C_{Tm} = ~~4.71 × 10⁻⁴~~ 7.49 × 10⁻³

$$C_{Fm} = \frac{0.075}{(\log_{10} R_n - 2)^2} =$$

$$R_n = \frac{V_m L_m}{\nu_m} = \frac{1.29 \times 2.978}{0.893 \times 10^{-6}} = 4.302 \times 10^6$$

$C_{Fm} = 3.49 \times 10^{-3}$

$C_{Rm} = C_{Tm} - C_{Fm}$

$C_{Rm} = 4 \times 10^{-3}$

$C_{Rm} = C_{Rp} = 4 \times 10^{-3}$

$$R_{np} = \frac{V_p L_p}{\nu_{sw}} = \frac{5.144 \times 47.5}{0.943 \times 10^{-6}} = 2.59 \times 10^8$$

$C_{Fp} = 1.82 \times 10^{-3}$

$C_{Tp} = C_{Fp} + C_R$

$= (1.82 + 4) \times 10^{-3} = 5.82 \times 10^{-3}$

$R_{Tp} = C_{Tp} \times \frac{1}{2} \rho_{sw} \times V_p^2 \times S_p$

$= 5.82 \times 10^{-3} \times \frac{1}{2} \times 1025 \times 5.144^2 \times 441.84$

$= \underline{\underline{34.904 \text{ kN}}}$

Similarly,

~~R_{Tm}~~

Speed (V_p knots)	10	11	12	13	14
in m/s	5.144	5.65	6.17	6.68	7.2
R_{Tm}	10.8	13.89	17.97	23.15	28.39
V_m	1.29	1.419	1.548	1.677	1.806
C_{Tm}	7.49×10^{-3}	7.96×10^{-3}	8.66×10^{-3}	9.506×10^{-3}	10.05×10^{-3}
R_{nm}	4.3×10^{6}	4.73×10^{6}	5.16×10^{6}	5.59×10^{6}	6.02×10^{6}
C_{Fm}	3.49×10^{-3}	3.43×10^{-3}	3.37×10^{-3}	3.32×10^{-3}	3.28×10^{-3}
C_R	4×10^{-3}	3.43×10^{-3}	3.37×10^{-3}	3.32×10^{-3}	3.28×10^{-3}
R_{Np}	2.59×10^{8}	2.85×10^{8}	3.109×10^{8}	3.368×10^{8}	3.627×10^{8}
C_{Fp}	1.82×10^{-3}	1.8×10^{-3}	1.77×10^{-3}	1.76×10^{-3}	1.74×10^{-3}
C_{Tp}	5.82×10^{-3}	6.33×10^{-3}	7.06×10^{-3}	7.93×10^{-6}	8.51×10^{-6}
R_{Tp}	$\boxed{34.904\ kN}$	$\boxed{45.926\ kN}$	$\boxed{60.936\ kN}$	$\boxed{80.39\ kN}$	$\boxed{99.96\ kN}$

Q6] Quiz 2 paper.

Q1] $V_s = 11$ knots

$= 11 \times 0.5144 = 5.6584$ m/s

$V_a = V_s(1-\omega)$

$= 5.6584(1-0.214)$

$= 4.447$ m/s

$R_T = T(1-t)$

$T = \frac{32.38}{1-0.307} = 46.724$ KN

Q2]

$$K_Q^{1/4} J^{-3/4} = \left[\frac{P}{2\pi \rho D^2 V_A^3}\right]^{1/4}$$

$$= \left[\frac{340000}{2\times3.14\times1025\times1.1^2\times4.4^3}\right]^{1/4}$$

$$= 0.846$$

$\eta = 0.47$ $\qquad 1/J = 2.75$

$P/D = 0.78$

$J = \frac{V_a}{nD} \Rightarrow n = 10.9$ rps

$$\eta = \frac{J}{2\pi}\frac{K_T}{K_Q} = \frac{T}{\rho n^2 D^4} \times \frac{2\pi \rho n^3 D^5}{P_D} \cdot \frac{J}{2\pi} = \frac{TnDJ}{P_D} = 0.47$$

$\therefore T = 35984.9$ N

$$\boxed{T = 35.984\,kN}$$

Q3] $P/D = 0.8$ $\qquad z = 0.4$

$D = 2m$

rpm $= 400 \Rightarrow 6.67$ rps

Bollard pull condition $\rightarrow V_a = 0$

$\therefore J = \frac{V_a}{nD} = 0$

$\therefore$ By T-J graph, for $P/D = 0.8 \Rightarrow K_Q = 0.035$

$K_Q = \frac{P_D}{2\pi \rho n^3 D^5} \Rightarrow P_D = 2139.536$ kW

By P-J diagram, $K_T = 0.32$

$K_T = \frac{T}{\rho n^2 D^4}$ $\qquad \boxed{T = 233.47\,kN}$

Q4]

$$\left(\frac{A_E}{A_O}\right)_{min} = \frac{[T(1.3 + 0.3Z)]}{(P_o - P_v)D^2}$$

$P_o = \rho g h = 1025 \times 9.81 \times 1.3 = 13071 \ N/m^2$

$P_{atm} = 101000 \ N/m^2$

$P_{total} = 114071.8$

$$\left(\frac{A_E}{A_O}\right)_{min} = \frac{(1.3 + 0.3 \times 4)\ 46.724 \times 10^3}{(114071.8 - 1750)(1.1)^2} = 0.859$$

It is not appropriate because it is larger.

Q5]

$P_D = 7766$ $K_T = 0.245$

$D = 2.6 \ m$

$P/D = 0.6$ $V_a = 0$ as tug. Hence, $J = 0$

$K_T = \frac{T}{\rho n^2 D^4} \rightarrow T = 621 \ kN$

$K_Q = 0.023 \Rightarrow \frac{P_D}{2\pi \rho n^3 D^5} = 0.023$

$n = 7.725 \ rps$