

Group Members:**Adesh Ghadage - 21NA30009****Harshwardhan salve - 21NA30027****Mohit Parte - 21NA30020****Nishkarsh Kundoliya - 21NA30021****Question Number 1:**

(1) A panamax tanker of length 220.0 m, breadth 32.2 m and full load draught 10.50 m is proceeding at a speed of 10 knots in deep sea prior to entering the navigation channel of a port. The dimensions of the navigation channel leading to the berth are (300.0 m width x 16.50 m depth). Assume that $C_b = 0.825$ around 10.50 m draft. Determine the following:

(a) Calculate new draft of the vessel using Tuck's expressions for sinkage and trim. Longitudinal center of floatation $1\% \cdot L$ forward of midship.

(b) Estimate the drop in the ship speed inside the navigation channel using Landweber's chart. Midship section area coefficient = 0.95. Assume the density of the navigation channel water is similar to sea water. Additional approximations may be made to get conservative estimates.

Given:

A panamax tanker		Dimension of Navigation Channel	
Lenght (m)	220	Width (m)	300
Breadth (m)	32.2	Depth (m)	16.5
Draught (m)	10.5		
Ship Velocity	10		
Block Coefficient	0.825		
Midship section area coefficient = 0.95			
density of the navigation channel water (kg/m^3) = 1025			

Solution:

1(a)

Froude Number ($F_h = V/(\text{gh})^{0.5}$)	0.78600177
(d/L)	0.047727273
$C_b/(L/B)$	0.12075
Sinkage (S/L)	0.005340625

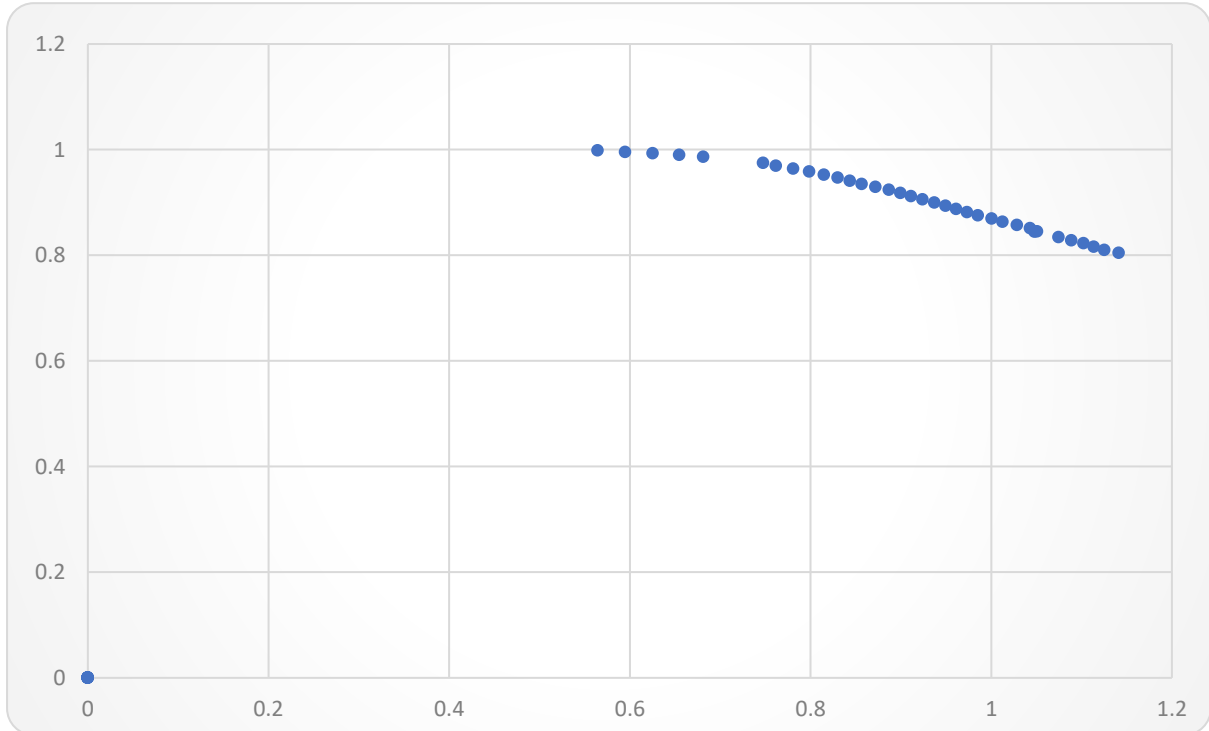
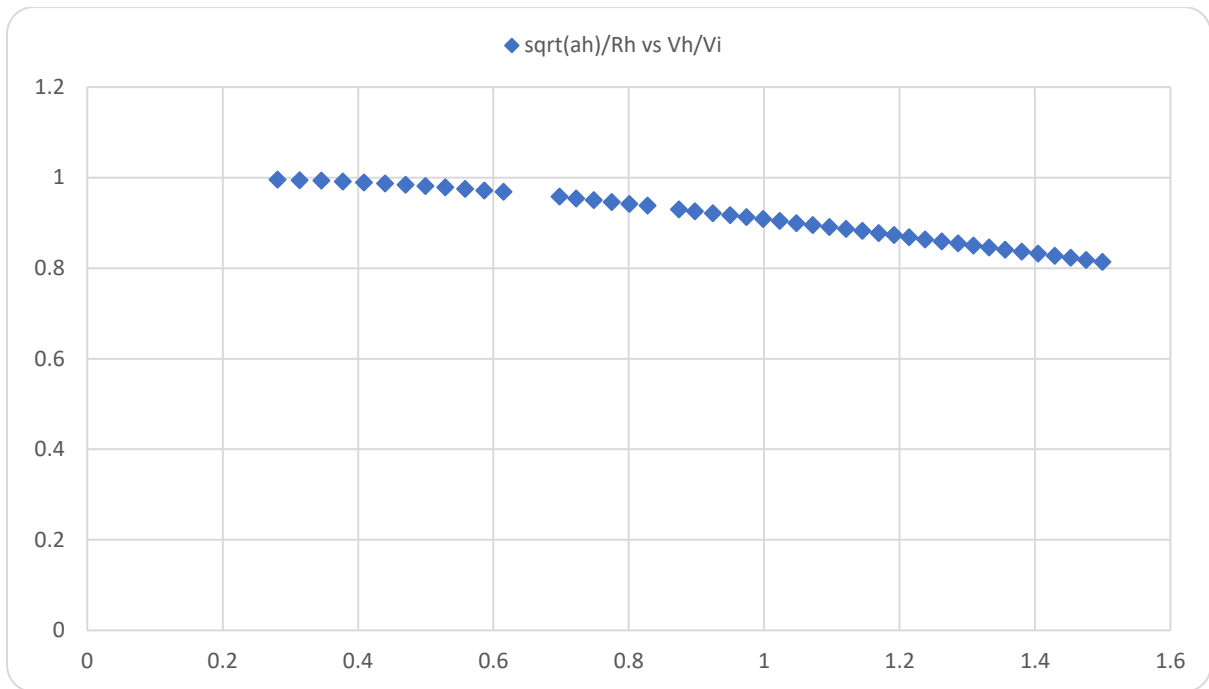
Trim (T) 0.001557386

S 1.602187429

T 0.467215879

New Draft of Vessel H(new)

H(new) 12.56940331



1(b)

hydraulic radius of the canal (R_h)

11.98551269

$(Ax)^{0.5}/R_h$

1.393454985

Now, Using landwader chart 1

\sqrt{ah}/R_h

V_h/V_i

1.38057	0.836635
1.393454985	0.834245798
1.40479	0.832144

$V(\text{infinite}) = 10$

$V(\text{infinite})/\sqrt{gh} = 0.985305363$

Now, Using landwader chart 2

$V(\text{infinite})/\sqrt{gh}$	$V_i/v(\text{infinite})$	V_i/\sqrt{gh}	V_i
0.973098	0.881283	0.857574725	10.91059533
0.985305363	0.875194748	0.862334079	10.97114678
0.985361	0.875167	0.86235543	10.97141842

Now,

$V_h/V_i = 0.834245798$

$V_i = 10.97114678$

$V_h = 9.152633102$

The drop in the ship speed inside the navigation channel (knots) = 0.847366898