1. Explain the following Terminologies(每小題 4 分，共 20 分)
   (1) Lines Drawing (includes 3 plans)
   (2) Curve of Centers of Buoyancy
   (3) Curve of Statical Stability
   (4) Bonjean Curves
   (5) Damage Stability

2. A research ship has the principal characteristics:
   (1) Length between Perpendiculars L_{pp} = 70.5m
   (2) Moulded Breadth B_{mld} = 8.0m
   (3) Moulded Draught T_{mld} = 5.1m
   (4) Displacemet Δ= 2093.3ton
   (5) Waterplane-area Coefficient C_{WL}=0.812
   (6) Midship-section area A_M=38.352m^2

   Calculate the following data: Block Coefficient C_B, Midship Coefficient C_M, Prismatic Coefficient C_P, Vertical Prismatic Coefficient C_{VP} and Increment of displacement per Centimeter Immersion. Suppose the ship is floating on salt water and the density of salt water ρ_{SW}=1.025t/m^3.   (15 分)

3. A ship's waterplane is 120m long. The **half-ordinates** commencing from afterward (station 0) as follows:

station i	0	0.5	1	2	3	4	5	6	7	8	9	9.5	10
ordinate y_i (m)	0.000	4.320	6.630	7.500	7.725	7.755	7.770	7.733	7.650	7.050	5.325	2.295	0.000

   The interval between the **first three and the last three** ordinates is **half** of that between the other ordinates. Use Simpson's rule to calculate the area of the waterplane (A_w), the position of the center of flotation (LCF), the transverse moment of inertia (I_T) and the longitudinal moment of inertia (I_L) of the waterplane.   (20 分)

4. A barge has a breadth B and a length L as shown in Figure (a) below. If the barge is changed into a *trimaran*(三體船) configuration as shown in Figure (b), calculate **metacentric radii** $\overline{BM}$ for the both cases and the ratio between them. Suppose that in both cases the displacements are the same.   (20 分)
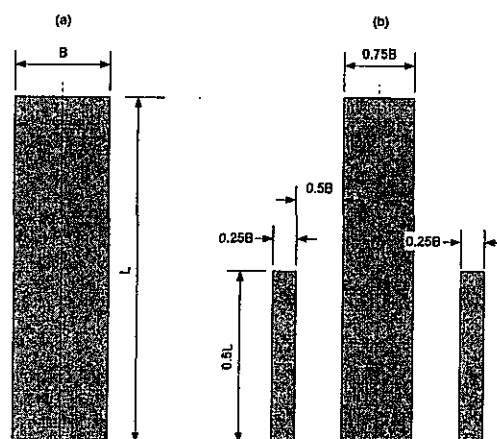
見背面

5. A small cargo ship has a ship length L_{pp}=75.5m and is used for transporting cargo in salt water region. If the specific weight of salt water is 1.025 and the weight items of a loading condition at **departure** (leaving a port) are shown in Table 1.

Table 1. Homogeneous cargo, departure

Weight item	Mass	v.c.g.	z-Moment	l.c.g.	x-Moment
	t	m	tm	m	tm
Lightship	1247.66	5.93	7398.62	32.04	39975.03
Crew and effects	3.60	9.60	34.56	11.00	39.60
Provisons	5.00	7.30	36.50	3.50	17.50
Fuel oil	177.21	1.56	276.45	30.88	5472.24
Lubricating oil	4.50	4.65	20.93	8.45	38.03
Fresh water	103.09	4.61	475.24	27.19	2803.02
Ballast water	10	1.50	15.00	25.00	250.00
Cargo in hold	993.94	4.35	4323.64	42.62	42361.72
Cargo on deck	0		0.00		0.00
Fruit cargo	90.00	6.08	547.20	38.66	3479.40
Full load	2635.00	4.98	13128.14	35.84	94436.54

Please determine the mean draft T_m, trim and the drafts at the forward and after perpendiculars T_F 及 T_A in this loading condition。 Suppose the ship has a part of hydrostatic data in the Table 2 shown below. The intermediate value can be calculated by linear interpolation.

Table 2. Small cargo ship - partial hydrostatic data

Draft T (m)	∇ (m³)	MCT (m-t/m)	LCB from midship(m)	LCF from midship(m)	Draft T (m)	∇ (m³)	MCT (m-t/m)	LCB from midship(m)	LCF from midship(m)
2.00	993	2206.	0.607	0.518	4.20	2471	3167	0.319	-0.314
2.20	1118	2296	0.600	0.460	4.32	2549	3223	0.291	-0.384
2.40	1243	2382	0.590	0.398	4.40	2609	3260	0.272	-0.430
2.60	1377	2470	0.575	0.330	4.60	2757	3336	0.225	-0.560
2.80	1504	2563	0.557	0.260	4.80	2901	3413	0.180	-0.698
3.00	1640	2645	0.537	0.190	5.00	3057	3485	0.131	-0.839
3.20	1776	2732	0.510	0.119	5.20	3210	3567	0.083	-0.960
3.40	1907	2824	0.480	0.041	5.40	3352	3639	0.033	-1.066
3.60	2045	2906	0.442	-0.035	5.60	3507	3716	-0.018	-1.158
3.80	2189	2293	0.406	-0.017	5.80	3653	3793	-0.067	-1.231
4.00	2322	3085	0.360	-0.210	5.96	3786	3863	-0.108	-1.281

(25 分)

試題隨卷繳回