CAMBRIDGE

Cambridge University Press
978-0-521-45870-2 - Sea Loads on Ships and Offshore Structures
O. M. Faltinsen
Index
More information

INDEX

Aarsnes, J. V., 193–7
Abramowitz, M., 111, 254
Abramson, H. N., 282, 284
Achenbach, E., 177, 207
added mass
  catamaran section in sway, 48–9
  circle near wall, 54
  circle with axis in free-surface (heave, high-frequency limit), 43–5
  circle with axis in free-surface (heave and sway), 49–50
  definition, 41–2
  ellipse, sway, infinite fluid, 53
  Lewis form sections (heave, high-frequency limit), 51–2
  rectangular sections, sway, infinite fluid, 53–4
  ship, forward speed effects, 55–7
added resistance in waves, 7–8, 145–8, 172–3
Airy wave theory, 17
anti-roll tank
  free-surface tank, 86–9
  U-tube tank, 86–9
Aquirre, J. E., 207
Armand, J. L., 288

Bai, K. J., 118
barge, motions and loads, 89–91, 127–8
Batchelor, G. K., 237
Bearman, P. W., 229, 238, 239, 245, 248
bending moment, barge in waves, 90–1
Bernoulli's equation, 13–14
  linearized, unsteady flow, forward speed, 57; zero mean speed, 18, 45
Beukelman, W., 146
Bishop, R. E. D., 98, 166
Bjørheden, O., 272
Blevins, R. D., 211
block coefficient, 69
boundary condition,
  on body, 14
  see also free-surface condition
boundary value problem
  forced heave, circular cylinder, 43–4
  forced heave, three-dimensional structure in waves, 109–10
bow flare section, wave loads, 308, 314–15
Boyce, T. R., 207
broaching, 7
Brown, C. E., 226
buoy, sway and roll, 95–7
Børresen, R., 124–5

cable line
  elastic solution, 268–70, 277–8
  inelastic solution, 260–5, 277–8
Campbell, I. M. C., 287–9, 299–300
Carpenter, L. H., 251
catamaran
  damping, zero speed, 73
  sway added mass, zero speed, 48–9
catenary equations, 260–1
Chaplin, J. R., 226, 235, 239
Chislett, M. S., 272
Chorin, A. J., 226
circulation, 183
Coanda effect, 270–2
Cointe, R., 288
conservation of momentum, 134–7
coordinate system, 39, 41
correlation length, steady flow, circular cylinder, 186
crane operations, forces, 306–8, 313–14
critical damping, 95, 97, 214
critical flow, circular smooth cylinder, 178
cross-flow principle, 188, 225
current,
  depth profile, 34
  effect on wave loads, large-volume structures, 124–6
  fishing net, forces and flow, 215–17
  offshore structure, loads, 200–6
  riser, lock-in, 208–9, 217–19
  ship, loads, 187–200
  single point mooring system, galloping, 219–22

D'Alembert's paradox, 177, 200
damping level, linear motions, 71–3
damping, viscous
  anchor lines, 160, 278
  bilge keel, roll, 73, 98, 240–1
  eddy-making, ship sections, roll, 73, 240–1
  eddy-making, slow-drift motion, 164–6,

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-45870-2 - Sea Loads on Ships and Offshore Structures
O. M. Faltinsen
Index
More information

241–4
skin friction, roll, 72
slow-drift surge, ship, 238
damping, wave-drift, 161–4
damping, wave radiation
catamaran, heave and pitch, 73
circle with axis in free-surface (heave and sway), 49–50
definition, 41–2
rectangular ship section, roll, 72
ship, forward speed effects, 56–7
damping coefficient, relation to radiated waves, 45–7
Davenport, A. G., 166–7
Delany, N. K., 193
density, air and water, 175
diffraction forces and moments, 39, 58–66
diffraction problem, 117
dipole, infinite fluid, 119–20, 128
dispersion relation
deep water, 16–17
finite depth, 16
Dommermuth, D. G., 22–3
double-body problem, 44, 200
drag coefficient
circular cylinder in steady current, roughness effect, 177
definition, 61, 177, 224–6
experimental tools, 249–53; analysis of C_D-coefficient, 251
high Keulegan–Carpenter number, 244–8; formula, 248
lock-in, 211–12
non separated laminar flow, circular cylinder, 237
ship sections in steady current, 190–7
small Keulegan–Carpenter number, 237–44, 254–6; bilge keel effect, 243; bilge radius effect, 242, 244; formulas, separated flow, 239, 256; rectangular sections, 242
two circular cylinders in steady current, 203–6
drift forces and moments
based on conservation of momentum, 134–7
direct pressure integration, 142–3
finite water depth, beam sea, two-dimensional flow, 138
irregular sea, 148–52
Lewis form section, beam sea, 139–40
Maruo's formula, beam sea, two-dimensional flow, 137–9
mean value formula, irregular sea, 150
small wavelengths, 142–6
tanker, irregular sea, 151–2
tanker, regular waves, transverse force, 141
three-dimensional flow, conservation of energy, 140–1
TLP, 171
vertical circular cylinder, effect of current, 163
viscous effects, 152–5
dynamic free-surface condition, 15
dynamic positioning, 276–7
dynamic pressure, 16

energy, potential flow, 45
conservation, 139
time derivative, 45
equations of motions, body in regular waves, 66–8
equivalent linearization
harmonic motions, 98
irregular sea, 98, 100, 166
Euler's equations, 134–5

Fage, A., 177, 181–2
Faltinsen, O. M., 65, 74, 117, 141, 145, 147, 158–9, 162, 164, 189, 192, 226–7, 243
Feng, C. C., 209–10
fishing nets, current forces and flow, 215–17
flow separation
steady flow, 179–81
unsteady flow, 228–34
Frank, W., 64
free decay tests, 252–3
free-shear layer, 184, 227
free-surface condition
exact, 14–15
second-order problem, 168
free-surface condition, linearized, 15, 17, 44
sinusoidal time-dependence, current, 124
sinusoidal time-dependence, forward speed, 123
sinusoidal time-dependence, zero speed, 17
frequency of encounter, definition, 55
Froude–Kriloff forces and moments, 39, 59–66, 225
Froude number, 1
Fuchs, R. A., 10, 61, 115

galloping, 212–15
ship at single-point mooring system, 219–22
Gauss theorem, 135, 297
Gerritsma, J., 85, 146
Graham, J. M. R., 238–41, 256
gravity platform, 1–2
Green function, 113
Green's second identity, 64, 66, 118–21, 128
Greenhow, M., 54, 299, 301–6, 308–12
Griffin, O. M., 211–12
group velocity, 18
Grue, J., 124

Hagiwara, K., 291–3
Haskind relation, 66

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-45870-2 - Sea Loads on Ships and Offshore Structures
O. M. Faltinsen
Index
More information

Havelock, T. H., 110
heave
  definition, 3, 39, 41
  natural periods of different structures, 4
Heinecke, E., 207
Hess, J. L., 116
Hoerner, S. F., 191
Hughes, G., 187
hundred year wave, 31
Huse, E., 160
hydrodynamic classification of structures, 10–11
hydrofoil catamaran, vertical motions, 92–5

Ikeda, Y., 73, 87, 241
irregular frequencies, 114–16, 128
Isaacson, M., 186, 223, 249
Isherwood, R. M., 207
ISSC (International Ship and Offshore Structures Congress), 23
ITTC (International Towing Tank Conference), 23
Iwashita, H., 126

jacket structure, 1–2
Johansen, F. C., 181–2
John, F., 114–15
Johnson, I. G., 238

Kato, H., 73, 87, 241
Kettleborough, C. F., 293
Keulegan, G. H., 251
Keulegan–Carpenter number, 223
Kim, M. H., 168–9
kinematic boundary conditions, 14–15
kinematic viscosity coefficient, air and water, 175
Kinsman, B., 23
Koehler, B. R., 293
Korsmeyer, F. T., 103

Laitone, E. V., 111, 123
Lamb, H., 184
Laplace equation, 13
large-volume structure, 102
Lecointe, Y., 226
Lee, C-H., 116
Lee, W. T., 32
Lewis form, 51, 83–4
Li, 54, 299, 306
Liapis, N., 219
lift coefficient, steady flow, 186
lift forces, high Keulegan–Carpenter number, 248–9, 254
Lin, W-M., 301–5, 309–12
lock-in, 207–12, 217–19
  amplitude of transverse oscillations, 210–11
  drag coefficient, 211–12
long-term prediction
  joint frequency wave height and period, 30
  linear response, 38–9
  sea states, 32
  waves, 29–31
  wind, 31–3
Longuet-Higgins, M. S., 138, 169
Lundgren, H., 291

Maruo, H., 136–7, 140
mass coefficient
  definition, 61, 224–6
  experimental tools, 249–53; analysis of C_M-coefficient, 251
  small KC-number, 239–40
McCamy, R. S., 10, 61, 115
Mei, C. C., 122
metacentric height, 58, 87, 89
Michael, W. H., 226
Michelsen, F., 117
Miloh, T., 308
Minsaas, K. J., 273, 275
modal period (T_0), 25
momentum of fluid, 134
moonpool, fluid motion, 99–100
mooring system
  single point, 219–22
  spread, 265–8, 278
  tension leg, 1, 257
  turret mooring, 278–80
Morison, J. R., 61, 223
Morison's equation, 61, 223–6, 253
motions
  arbitrary point, linear theory, 41
  high-frequency, 3–5
  slow-drift, 3–5
  wave-frequency, 3–5
Motter, L. E., 296
Munk moment, 188–190, 197–202
Murdey, D. C., 85

natural period
  free-surface tank, 35, 87
  moonpool, 99
  SES, heave, 91
  uncoupled body motions, 68–71
  U-tube tank, 88
Newman, J. N., 17, 18, 45, 65–6, 111, 121, 136, 157, 168–9, 184, 188, 200–1, 287

Ochi, M. K., 27, 296
Ogilvie, T. F., 22, 68, 139
Ohkusu, M., 126
Overvik, T., 215

Palm, E., 124
Parkinson, G. V., 214
Pettersen, B., 226–7
phase angle, 37
phase velocity, 18
Pinkster, J. A., 142, 159
Piquet, J., 226
pitch, definition, 3, 39, 41

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-45870-2 - Sea Loads on Ships and Offshore Structures
O. M. Faltinsen
Index
More information

pressure coefficient, 175
  smooth circular cylinder, steady flow, 176
Price, W. G., 98, 166

radiation condition, 110
Rayleigh distribution, 25–6, 38, 164, 294
reduced velocity, 174, 223
relative current number, 223
restoring coefficients, 58
Reynolds number, 174, 223
ringing, 5
riser, 1
  lock-in, 208–9, 217–19
roll, definition, 3, 39, 41
Roshko, A., 176
roughness number, 174, 223
Routh, E. J., 221

Salvesen, N., 56, 64
Sarpkaya, T., 186, 210–11, 223–4, 226, 229, 239–40, 249
Schlichting, H., 178–80, 203, 230, 234, 270
Schmidt, D. K., 245–6
Schmitke, R. T., 85
Schwartz, L. W., 22, 76
Sclavounos, P., 116, 121
sea state, statistics, wind and waves, 32
semi-submersible motions, linear
  heave, beam sea, 76–9
  heave and pitch, head sea, 79–81
SES (Surface Effect Ship), definition, 1
  resonance heave motion, 91–2
shear stress, oscillatory flow
  laminar flow, 236–7
  turbulent flow, 238
ship motion criteria, 8–9
ship motions, linear
  minimalization, heave and pitch, 81–5
  roll, 97–9
  roll stabilization, 85–9
Shoaff, R. L., 210–11, 226
short-term prediction
  linear response, 37–8
  slow-drift motions, extreme values, 164
  waves, 23–9
single point mooring system, galloping motion, 219–22
sink, 103
Skop, R. A., 211
slamming coefficient, circular cylinder, 287, 299–300
slamming loads
  bow-flare section, 308, 314–15
  horizontal bracing, 308, 313
  vertical cylinder, 313
slamming pressure
  acoustic, 290–1
  circular cylinder, 287–92
  equivalent static pressure, 292
  extreme values, 294–6
  threshold velocity, 296
  von Karmann theory, 287
  Wagner theory, 287–92
  wedge, 292–3
sloshing, 7, 282, 284
slow-drift motions, waves
  moored ship, 160, 164–6, 171–2
  most probable largest value, 164
  Newman's approximation, 157–9
  second-order transfer functions, 156–9
  spectral density, excitation loads, 159
  standard deviation, 159–60
  tension leg platform, 170–1
  turret moored ship, 278–80
slow-drift motions, wind, 166–8
  tension leg platform, 171
small-volume structure, 61
Smith, A. M. O., 116
Smith, P. A., 226
Sorensen, N. E., 193
Sortland, B., 220, 243, 249–51
sound velocity, water, 290–1
source
  harmonically oscillating with free-surface effects, forward speed or current effects, 123–6; zero forward speed, 110–13
  infinite fluid, 103
source technique
  induced velocity by source element, 106–8, 127
  infinite fluid, two-dimensional, 104–9
  wave effects, three-dimensional, 109–17
source and dipole technique
  wall effects, two-dimensional, 128
  wave effects, three-dimensional, 119–21
Sparks, C. P., 211, 217–18
speed reduction
  involuntary, 7–8
  voluntary, 7–8, 282, 296
splitter plate, 191–2
springing, 5, 7, 131, 223
Stansby, P. K., 226
Stegun, I. A., 111, 254
Stokes, G. G., 237
Stokes drift velocity, 21–2
strip theory,
  semi-submersible, 52–3
  ship, 50, 56, 197, 200
Strom-Tejsen, J., 146, 151
Strouhal number, 186, 207
  circular cylinder, steady current, roughness effect, 207
subcritical flow, circular smooth cylinder, 178
substantial derivative, 14
sum-frequency effects, 168–9
supercritical flow, circular smooth cylinder, 178
surge, definition, 3, 39, 41
SWATH, definition, 1–2
sway, definition, 3, 39, 41

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-45870-2 - Sea Loads on Ships and Offshore Structures
O. M. Faltinsen
Index
More information

Tanaka, N., 73, 193, 242, 244
Tasai, F., 84
Telionis, D. P., 228–9
Telste, J. G., 308
tension leg platform (TLP)
  definition, 1–2
  linear motions and loads, 74–6
  linear vertical excitation force, 62–4
  slow-drift motions, waves and wind, 170–1
thruster forces, 270–5
  Coanda effect, 270–2
  current effect, 272–3
  free-surface effect, 273–5, 278
thruster system, design data, 280–1
Tilman, P. M. O., 245–6
towing cable, analysis, 270
transcritical flow, circular smooth cylinder, 178
transfer function, 37, 85, 101, 156–9, 294
turret-moored ship, 278–80

U-tube tank, 86–9, 249–51

van Oortmersen, G., 142
velocity potential, definition, 13
ventilation of propeller, 273–5
Verhagen, J. H. G., 292
Verley, R. L. P., 248
Vinje, T., 226
Von Karman, T., 287, 296
vortex decay, 246
vortex streets, von Karman, 184–6
vorticity, 13, 181–3
Vugts, J. M., 72

Wagner, H., 287–8, 290, 292
wake flow, 181–7
  velocity, 203–4, 216–17
Wang, C-Y., 237, 240
Warsap, J. H., 177
waterplane area coefficient, 69
wave-drift damping, 161–4
  mean value, irregular sea, 164
  ship, surge, head sea, regular waves, 162
  vertical circular cylinder, surge, regular waves, 163
wave excitation loads, linear
  long wavelength approximation, 60–2
  relation to damping coefficients, 65–6
  ship, vertical force and pitch moment, 64–5
  TLP, vertical force, 62–4
wave excitation loads, non-linear, potential flow
  sum-frequency effect, 168–9
  see also drift forces and moments
wave energy density, 47
wave height,
  most probable largest, 27
  significant, 1, 24
wave-induced motions, linear
  barge, 89–91, 127–8
  buoy, sway and roll, 95–7
  hydrofoil-catamaran, vertical motions, 92–5
  semi-submersible, beam seas, heave, 76–9
  semi-submersible, head seas, heave and pitch, 79–81
  SES, head seas, heave, 91–2
  ship, heave and pitch, minimalization, 81–5
  ship, roll, 97–9
  TLP, 74–6
wave period
  mean (T_1), 24–5
  mean (T_2), 24–5
  modal (T_0), 25
wave spectrum
  function of frequency of encounter, 100–1
  ISSC, 23–4
  ITTC, 23, 25
  JONSWAP, 25
  Pierson–Moskowitz, 24–5
  short-crested, 27
wave statistics, significant wave height and period, 30
wave-theory
  forward speed or current-structure interaction, 122–6, 128–30
  linear, 16–21; table, 16
  second-order wave elevation, regular waves, 21
  Stokes drift velocity, regular waves, 21

Wehausen, J. V., 111, 123
Weynberg, P. A., 287–9, 299–300
whipping, 7
wind
  loads, mean value, 207
  slowly varying motions of structures, 166–8
  spectrum, Harris, 31
Wichers, J. E. W., 160, 162
Williamson, C. H. K., 299

yaw, definition, 3, 39, 41
Yeung, R., 118, 122
Yue, D. K. P., 168–9
Yuhura, T., 291–3

Zdravkovich, M. M., 204–6
Zhao, R., 121, 125, 132, 146, 158–9, 162, 164, 233, 235

© Cambridge University Press www.cambridge.org