

Index

- additive decomposition, 55
- aluminium alloy BS 1472, 113
- asymptotic series expansion, 82
- asymptotic solution, 30

- backstress, 84
- Bauschinger effect, 41
- beam, 97, 124
 - Bernoulli-Euler theory, 97, 128, 131
 - first order shear deformation theory, 74, 124, 126, 128, 129, 131
 - Levinson-Reddy type theory, 128
 - third order shear deformation theory, 128
 - Timoshenko-type theory, 98, 124, 128
- benchmark problem, 97, 117, 119, 121, 143, 174
- boundary conditions, 53, 73, 102, 190, 194, 195
- boundary element method, 72
- bulk modulus, 56

- closed form solution, 19
- combined action of the normal and shear stresses, 124
- compatibility condition, 63, 64, 141, 156, 183
- compliance matrix, 62
- constitutive equation, 3, 53, 63, 101
 - inelastic strain rate, 56
 - shear force, 129
- cool-down stage, 5
- coordinate system
 - Cartesian, 140
 - polar, 140
- Crank-Nicolson method, 68
- creep, 1
 - analysis, 124
 - cyclic, 84
 - exponential, 22
 - Norton-Bailey-Odqvist, 170
 - potential, 126
 - primary, 9, 32, 113, 117, 120, 170, 172
 - ratcheting, 78
 - secondary, 117, 120, 170, 172, 195
 - steady-state, 97, 117, 127, 129, 131, 170, 191, 195
 - tertiary, 172, 193
- creep rate, 9
 - initial, 9
 - minimum, 9
- creep strain tensor, 190
- creep test, 9
 - torsion, 122
 - uniaxial, 122
- creep-damage, 102
 - constitutive equations, 102
- cross section assumptions, 124
- cycle jumping technique, 81

- damage, 117
 - equivalent stress, 190
 - evolution, 190
 - model, 81
 - parameter
 - scalar-valued, 190
 - variable, 56, 102
- differential matrix, 62
- direct approach, 126, 130, 188
- direct variational methods, 72, 74, 170
- displacement, 7, 54
 - formulation, 65, 66
 - vector, 61
- divergence theorem, 73
- double power law, 147, 157
- downshock, 4

- edge effects, 187
- elastic springback, 33
- elasticity matrix, 62
- equilibrium condition, 63, 64, 101, 129, 141, 171, 176, 182
- equivalent moment, 179, 183
- Euler method
 - explicit, 11, 18, 45, 47, 66, 87
 - implicit, 15, 18, 47, 49, 68
- evolution equation
 - creep-damage, 102
- evolution equations, 53, 63
 - internal state variables, 56
- fatigue damage, 78
- finite deflection model, 171
- finite difference method, 72, 170, 172
- finite element mesh density, 119
- finite element method, 76
- finite element solution, 117, 121
- first order shear deformation plate theory, 194
- fixed-point iteration, 48, 68
- flexibility factor, 201
- flow rule
 - von Mises-Odqvist, 144, 156, 179
- fluid
 - linear viscous, 3
- force
 - centrifugal, 153, 156
- force tensor, 175
- Frederick-Armstrong type inelastic model, 57
- Frederick-Armstrong type model, 84
- Galerkin method, 72
- Garofalo law, 25, 39
- generalized area moment, 111
- generalized trapezoidal rule, 68
- hardening
 - cyclic, 78
 - structural, 172
 - variable, 56, 102
- Hooke's law
 - generalized, 55, 141
- hyperbolic sine law, 30, 37
- implicit method, 68
- in-plane stiffness tensor, 178
- inelastic potential, 178
- inelastic strain tensor, 54
- inelastic strains, 3
- initial conditions, 53, 56, 63
- initial-boundary value problem, 172, 188
 - vector-matrix representation, 61
- internal state variable, 54, 63
- iso-strain rate concept, 29
- iso-stress concept, 29
- Kachanov-Rabotnov model, 116, 119
- kinematical equations, 63, 101, 171
- Lamé solution, 159
- linear viscous behavior, 5
- loading
 - cyclic, 78, 81, 82
 - in-plane, 137
- material independent equations, 53
 - boundary conditions, 55
 - compatibility condition, 2, 55
 - equilibrium conditions, 2, 55
 - kinematic equation, 2, 55
 - strain-displacement relation, 2, 55
- material symmetry, 126
- mesh density, 118
- mixed formulations, 65
- mixed variational formulations, 74
- mixed variational principle, 129
- moment tensor, 175
- monotonic loading, 39
- motion, 54
- neutral stress-free plane, 124
- Newton-Raphson iteration method, 49, 69
- non-classical thickness distributions
 - displacements, 124
 - strain field, 124
 - stress field, 124
- Norton-Bailey law, 97
- oscillation
 - non-physical, 13
- oscillatory solution, 13
- out-of-plane stiffness tensor, 178
- Paris law, 81
- periodic loading, 8
- pipe, 1
- plane strain state, 139, 142, 144, 160
- plane stress problem, 131, 137
- plane stress state, 138, 141, 156, 160, 199
- plasticity
 - rate-independent, 3, 47
 - rigid, 46
- plate, 124
 - circular, 172, 182
 - first order shear deformation theory, 173, 175

- Kirchhoff, 170
- Kirchhoff theory, 181
- Kirchhoff type theory, 173
 - moderately thick, 187
 - Reissner type theory, 172
 - shear deformable, 129
 - thin, 137
 - von Kármán, 74
- position vector, 53
- power law, 40, 145, 148, 155, 157, 180, 185, 198
 - breakdown, 25, 40
 - creep, 37
 - stress function, 23
- pressure vessel, 169
- principle of virtual displacements, 73, 103, 127, 188
- process
 - rapidly varying, 78
 - slowly varying, 78
- recovery process, 33
- refined models of beams, plates and shells, 124
- relaxation, 1
- relaxation test, 36
- residual stress, 33, 41
- response functions of stress, 21
 - double power law, 21
 - Garofalo law, 21
 - power law, 21
 - Prandtl-Eyring law, 21
- Ritz method, 72, 74, 75, 97, 103, 113, 118
- rotating component, 153
- Runge-Kutta method, 67
- shear correction factor, 130, 131
- shear force vector, 175
- shear stiffness tensor, 178
- shell
 - cylindrical, 172
 - first order shear deformation theory, 172
 - Kirchhoff-Love, 170
 - Kirchhoff-Love theory, 172
 - Kirchhoff-Love type theory, 173
 - transversely loaded, 124
- shell of revolution
 - axisymmetrically loaded, 171
- softening
 - cyclic, 78
 - variable, 56, 102
- St. Venant model, 3
- steam transfer line, 169
- step-by-step solution, 75
- stiff differential equation, 14, 68
- stiffness matrix, 62
- straight normal hypothesis, 130
- strain, 7
 - deviator, 56
 - hardening, 170
 - tensor, 55
 - transverse shear, 124
 - transverse shear strain, 188
 - vector, 61
- strain rate, 7
- strain rate tensor, 144, 199
- strain-displacement relation, 63, 140
- strains
 - thermal, 3
- stress
 - first principal, 123, 190
 - maximum tensile, 131, 190
 - mean, 195
 - redistribution, 1, 9, 29, 31, 170
 - relaxation, 23, 38
 - resultant, 175
 - resultants, 101, 188
 - saturation, 31
 - second order, 194
 - tensor
 - deviatoric part, 195
 - transverse shear, 124, 130, 133, 173
 - vector, 61
 - von Mises, 195
- stress formulation, 65
- stress function
 - double power law, 24
 - hyperbolic sine, 24
 - power, 127
- stress redistribution, 170, 195
- stress state effects, 122
- stress-based approximations, 128
- tangent stiffness, 48
- thermal cycle, 4
- thick cylinder, 143
- through-the-thickness approximation, 128, 129, 189
- time average operator, 83
- time hardening, 170
- time integration
 - explicit, 75
 - implicit, 104
- time integration methods, 10, 53, 65, 66, 69, 71, 77, 119
- time scale function, 82
- time step control, 119
- time step size, 119
- time-averaging technique, 81

- time-step method, 65
- transformation matrix, 61
- transverse normal stress, 194
- transverse shear deformation, 98
- transverse shear stress, 189, 194
- trapezoidal rule, 16, 19, 43
- tube
 - boiler, 169
 - thin-walled, 197
- two-bar system, 1, 9, 26, 36
- type 316 stainless steel, 122, 131, 190

- upshock, 4

- variational formulations, 72, 73
- variational principle, 127
- vector of body forces, 61
- vector of creep strains, 61
- vector of internal variables, 61
- vector of surface forces, 61
- vector of thermal strains, 61
- vector-matrix notation, 74
- visco-plasticity, 47, 49
- viscosity, 6
- Vlasov-Kantorovich method, 72

- warm-up stage, 5