–23 (continued)
nts, and Deflections

NTRATED LOADS UNSYMMETRICALLY PLACED

$_{max}$ when $a < b$) ..... $= \frac{P}{l}(l - a + b)$

$_{max}$ when $a > b$) ..... $= \frac{P}{l}(l - b + a)$

$a < x < (l - b)$) ..... $= \frac{P}{l}(b - a)$

$_{max}$ when $a > b$) ..... $= R_1 a$

$_{max}$ when $a < b$) ..... $= R_2 b$

$x < a$) ..... $= R_1 x$

$a < x < (l - b)$) ..... $= R_1 x - P(x - a)$

CENTRATED LOADS UNSYMMETRICALLY PLACED

..... $= \frac{P_1(l - a) + P_2 b}{l}$

..... $= \frac{P_1 a + P_2(l - b)}{l}$

$a < x < (l - b)$) ..... $= R_1 - P_1$

$_{max}$ when $R_1 < P_1$) ..... $= R_1 a$

$_{max}$ when $R_2 < P_2$) ..... $= R_2 b$

$x < a$) ..... $= R_1 x$

$a < x < (l - b)$) ..... $= R_1 x - P_1(x - a)$

D AT OTHER — UNIFORMLY DISTRUBTED LOAD

Uniform Load ..... $= wl$

..... $= \frac{3wl}{8}$

$_{ax}$ ..... $= \frac{5wl}{8}$

..... $= R_1 - wx$

..... $= \frac{wl^2}{8}$

$x = \frac{3}{8}l$) ..... $= \frac{9}{128}wl^2$

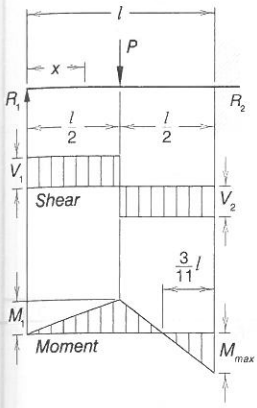
..... $= R_1 x - \frac{wx^2}{2}$

$x = \frac{l}{16}(1 + \sqrt{33}) = 0.422\,l$) ..... $= \frac{wl^4}{185\,EI}$

..... $= \frac{wx}{48\,EI}(l^3 - 3lx^2 + 2x^3)$

Table 3–23 (continued)
Shears, Moments, and Deflections

13. BEAM FIXED AT ONE END, SUPPORTED AT OTHER — CONCENTRATED LOAD AT CENTER



Total Equiv. Uniform Load ..... $= \frac{3P}{2}$

$R_1 = V_1$ ..... $= \frac{5P}{16}$

$R_2 = V_2 = V_{max}$ ..... $= \frac{11P}{16}$

M_{max} (at fixed end) ..... $= \frac{3Pl}{16}$

M_1 (at point of load) ..... $= \frac{5Pl}{32}$

M_x (at $x < \frac{l}{2}$) ..... $= \frac{5Px}{16}$

M_x (when $x > \frac{l}{2}$) ..... $= P\left(\frac{l}{2} - \frac{11x}{16}\right)$

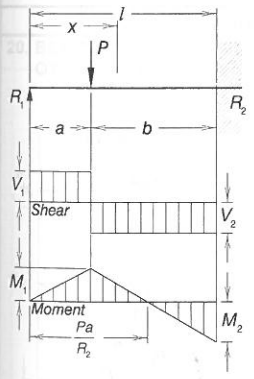
Δ_{max} (at $x = \frac{l}{\sqrt{5}} = 0.447\,l$) ..... $= \frac{Pl^3}{48\,EI\sqrt{5}} = 0.00932\frac{Pl^3}{EI}$

Δ_x (at point of load) ..... $= \frac{7Pl^3}{768\,EI}$

Δ_x (at $x < \frac{l}{2}$) ..... $= \frac{Px}{96\,EI}(3l^2 - 5x^2)$

Δ_x (at $x > \frac{l}{2}$) ..... $= \frac{P}{96\,EI}(x - l)^2(11x - 2l)$

14. BEAM FIXED AT ONE END, SUPPORTED AT THE OTHER — CONCENTRATED LOAD AT ANY POINT



$R_1 = V_1$ ..... $= \frac{Pb^2}{2l^3}(a + 2l)$

$R_2 = V_2$ ..... $= \frac{Pa}{2l^3}(3l^2 - a^2)$

M_1 (at point of load) ..... $= R_1 a$

M_2 (at fixed end) ..... $= \frac{Pab}{2l^2}(a + l)$

M_x (at $x < a$) ..... $= R_1 x$

M_x (when $x > a$) ..... $= R_1 x - P(x - a)$

Δ_{max} $\left(\text{when } a < 0.414l \text{ at } x = l\sqrt{\frac{\left(l^2 + a^2\right)}{\left(3l^2 - a^2\right)}}\right)$ .. $= \frac{Pa}{3EI}\frac{\left(l^2 - a^2\right)^3}{\left(3l^2 - a^2\right)^2}$

Δ_{max} $\left(\text{when } a > 0.414l \text{ at } x = l\sqrt{\frac{a}{2l + a}}\right)$ ..... $= \frac{Pab^2}{6EI}\sqrt{\frac{a}{2l + a}}$

Δ_a (at point of load) ..... $= \frac{Pa^2b^3}{12\,EIl^3}(3l + a)$

Δ_x (when $x < a$) ..... $= \frac{Pb^2x}{12\,EIl^3}(3al^2 - 2lx^2 - ax^2)$

Δ_x (when $x > a$) ..... $= \frac{Pa}{12\,EIl^3}(l - x)^2(3l^2x - a^2x - 2a^2l)$