

```
Apply[Clear, Names["Global`*"]];  
Off[General::spell];  
Off[General::spell1];
```

```
P = 100; (* lb *)  
R1 = 10 / 2; (* in *)  
R2 = 14 / 2; (* in *)  
 $\mu_{12} = 0.3;$ 
```

```
"a) "  
M = 2 / 3  $\mu_{12}$  P R1;  
Print["M = ", M, " lb in];
```

```
"b) "  
 $\mu_{23} = 3 / 2 M / (P R2);$   
Print[" $\mu_{23} =$ ",  $\mu_{23}$ ];
```

a)

M = 100. lb in

b)

$\mu_{23} = 0.214286$

```
Apply[Clear, Names["Global`*"]];
Off[General::spell];
Off[General::spell1];

p = k / r;
int1 = Integrate[μ p r^2, {r, Ri, Ro}];
M = Integrate[int1, {θ, 0, 2 Pi}];

int1 = Integrate[p r, {r, Ri, Ro}];
L0 = Integrate[int1, {θ, 0, 2 Pi}];

rap = M / L0;
M = Simplify[L rap];
Print["M = ", M];
```

$$M = \frac{1}{2} L (R_i + R_o) \mu$$

Problem II.8.5

$$\sum F_n = 0; \quad T \sin \frac{d\theta}{2} + (T + dT) \sin \frac{d\theta}{2} = 2dN \sin \frac{\alpha}{2} \quad (1)$$

$$Td\theta = 2dN \sin \frac{\alpha}{2} \quad (2)$$

$$\sum F_t = 0; \quad T \cos \frac{d\theta}{2} + 2\mu dN = (T + dT) \cos \frac{d\theta}{2} \quad (3)$$

$$2\mu dN = dT \quad (4)$$

$$\frac{dT}{T} = \frac{\mu}{\sin \frac{\alpha}{2}} d\theta \quad (5)$$

$$\int_{T_1}^{T_2} \frac{dT}{T} = \frac{\mu}{\sin \frac{\alpha}{2}} \int_0^\beta d\theta \quad (6)$$

$$\ln \frac{T_2}{T_1} = \frac{\mu\beta}{\sin \frac{\alpha}{2}} \quad (7)$$

$$T_2 = T_1 e^{\frac{\mu\beta}{\sin \frac{\alpha}{2}}} \quad (8)$$

```
Apply[Clear, Names["Global`*"]];
Off[General::spell];
Off[General::spell1];

b = 0.08; (* m *)
r = 0.3; (* m *)
h = 0.15; (* m *)
l = 0.8; (* m *)
theta = 3/2 Pi;
Pmax = 0.6 * 10^6; (* Pa *)
μ = 0.3;

P1 = Pmax r b;
P2 = P1 / Exp[μ theta];
T = (P1 - P2) r;
Print["T = ", T, " N m"];

F = P2 (1 - h) / l;
Print["F = ", F, " N"];

T = 3269.21 N m

F = 2845.88 N
```

```
Apply[Clear, Names["Global`*"]];
Off[General::spell];
Off[General::spell1];

n = 1800; (* rpm *)
β = Pi / 10;
mp = 0.012 / (32.212); (* lb s^2 / in^2 *)
d = 3.7; (* in *)
theta = 165 / 180 Pi;
μ = 0.3;
Tmax = 200; (* lb *)

V = Pi d n / 60;
Print["V = ", V, " in/s"];

Tc = mp V^2;
Print["Tc = ", Tc, " lb"];

T1 = Tmax;
T2 = Tc + (T1 - Tc) / Exp[μ theta / Sin[β]];
Print["T2 = ", T2, " lb"];

M = (T1 - T2) d / 2;
Print["M = ", M, " ln in"];

H = M / 12 n / 5252;
Print["H = ", H, " hp/belt"];

No = Ceiling[25 / H];
Print["N = ", No];

V = 348.717 in/s
Tc = 3.7765 lb
T2 = 15.7595 lb
M = 340.845 ln in
H = 9.73472 hp/belt
N = 3
```

```
Apply[Clear, Names["Global`*"]];
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n = 3500; (* rpm *)
β = Pi / 10;
g = 9.81; (* m/s^2 *)
mp = 2.2 / g; (* kg/m *)
d = 0.18; (* m *)
theta = 160 / 180 Pi;
μ = 0.33;
Tmax = 1300; (* N *)

V = Pi d n / 60;
Print["V = ", V, " m/s"];

Tc = mp V^2;
Print["Tc = ", Tc, " N"];

T1 = Tmax;
T2 = Tc + (T1 - Tc) / Exp[μ theta / Sin[β]];
Print["T2 = ", T2, " N"];

M = (T1 - T2) d / 2;
Print["M = ", M, " N m"];

H = M n / 9549;
Print["H = ", H, " kW"];

V = 32.9867 m/s
Tc = 244.024 N
T2 = 297.545 N
M = 90.221 N m
H = 33.0687 kW
```