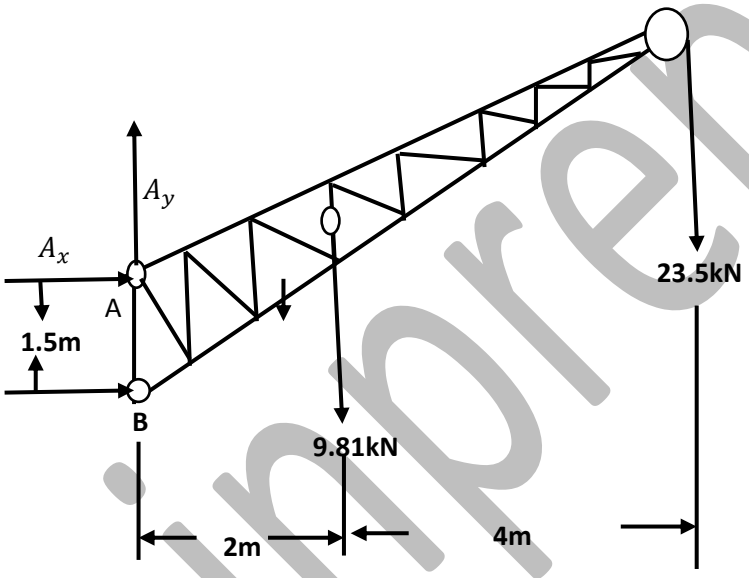
SOME SOLUTIONS TO APPLIED MECHANICS 2013

3. Let's determine an equivalent force F at B and a couple if the couple is 3000N.

From $C_n = FxL \Rightarrow F = \frac{C_n}{L}$

Numerical Application:$F = \frac{3000}{40} = \mathbf{75F.}$ Thus correct answer is D

8. The free body diagram is shown below.



By multiplying the masses of the crane and crate by g = 10m/g^2, we obtain the corresponding weights 10kN and 24kN. The direction of the reaction at the pin A is unknown represented by $\boldsymbol{A_x}$ *and* $\boldsymbol{A_y}$ and **B.**

For the system to be at equilibrium the sum of moments about any point must be equal to zero. Thus about A we have

$\sum M_A = 0 \Rightarrow \boldsymbol{B}\,(1.5) - 2xW_{crane} - 6xW_{crate} = 0 \Rightarrow \boldsymbol{B} = \frac{2xW_{crate}+6xW_{crane}}{1.5}$

Numerical Application: **B**$= \frac{20+144}{1.5} = \mathbf{10933.33.}$ Thus correct answer is **A**

16. We have $D = 20mL = 500mF = 45KNE = 200KN/m^2$

Stress of the rod is given by $\tau = \frac{F}{s} = \frac{4F}{\pi D^2}$

Numerical Application:$\tau = \frac{4x45000}{\pi(20)^2} = \mathbf{143.31N/m^2.}$ Thus the answer is **A**

17. The Strain of the rod:

From $\sigma = \varepsilon . E \Rightarrow \varepsilon = \frac{\sigma}{E}$

Numerical Applications:$\varepsilon = \frac{143.24}{200000} = 7.165x10^{-4}$. Thus B is the correct answer.

18. We determine the extension of the bar due to applied load.

From $\varepsilon = \frac{\Delta L}{L} \Rightarrow \Delta L = L\varepsilon = 7.165x10^{-4}x500 = \mathbf{0.358m.}$ Thus **C** is correct.

19. We calculate the magnitude of the load.

$\tau = \frac{2F}{s} \Rightarrow 2F = \frac{\tau\pi D^2}{4} \Rightarrow F = \frac{\tau\pi D^2}{8} = \frac{75000x\pi 0.1^2}{8} = \mathbf{293.375KN.}$ Thus B is correct.

20. We calculate the Longitudinal Strain produced.

We have $\varepsilon = \frac{\sigma}{E} = \frac{75000}{1.5x108} = 5x10^{-4} = \mathbf{0.0005.}$ Thus the true answer is **B**

21. We calculate the total decrease in length.

$\Delta L = \varepsilon L = 0.0005x4 = \mathbf{0.002.}$ Thus correct answer is **D.**

22. Let's calculate the stress in the rod

We have $\tau = \frac{4F}{\pi D^2} = \frac{4x20}{\pi x0.02^2} = \mathbf{63661.977KN/m^2}$. Thus correct answer is **A.**