



College of Engineering & Technology

Department: Mechanical Engineering

Marks: 15

Lecturer: Dr. Rola Afify

Time: 1.00 - 2.00

Course Code: ME356

Date: 4/11/2015

Name: **Model Answer**

R.N.:

Answer the following questions:

Question one (6 marks)

A) Define:

i) Stiffness:

2. Stiffness. It is the ability of a material to resist deformation under stress. The modulus of elasticity is the measure of stiffness.

ii) Plasticity:

4. Plasticity. It is property of a material which retains the deformation produced under load permanently. This property of the material is necessary for forgings, in stamping images on coins and in ornamental work.

iii) Resilience:

10. Resilience. It is the property of a material to absorb energy and to resist shock and impact loads. It is measured by the amount of energy absorbed per unit volume within elastic limit. This property is essential for spring materials.

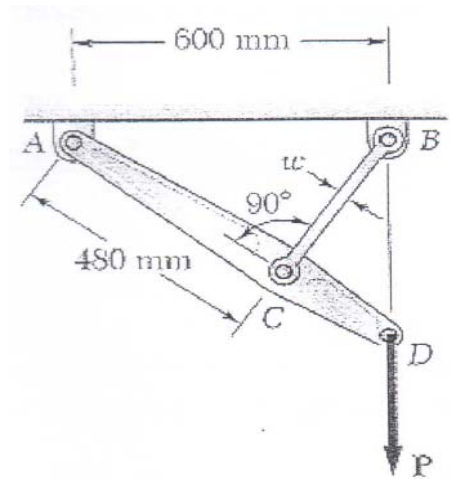
B) What are the general procedures in Machine Design?

* General procedure in machine Design

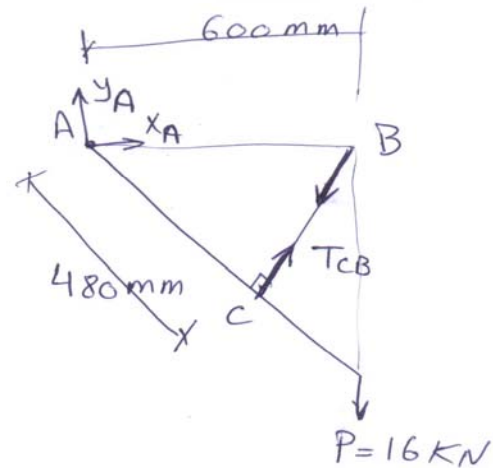
- ① Recognition of a need
- ② Mechanism
- ③ Analysis of forces
- ④ Material selection
- ⑤ Design of elements (size and stresses)
- ⑥ Modifications
- ⑦ Detailed drawing
- ⑧ production

Question two (9 marks)

Link BC, shown in Figure, is 6 mm thick, has a width $w = 25$ mm, and is made of steel with a 480 MPa ultimate strength in tension. What was the used factor of safety if this structure was designed to support a load P of 16 kN?



$$\begin{aligned} Q_2 \\ A_{BC} &= 6 \times 25 \text{ mm}^2 \\ S_u &= 480 \text{ MPa} \\ f.s. &= ?? \end{aligned}$$



Soln

$$\sum M_A = 0 \quad (\uparrow)$$

$$T_{CB} \times 480 - 16 \times 600 = 0$$

$$\therefore T_{CB} = 20 \text{ kN}$$

$$\sigma_t = \frac{F}{A} = \frac{S_u}{f.s.}$$

$$\frac{20 \times 10^3}{6 \times 25} = \frac{480}{f.s.}$$

$$\begin{aligned} \therefore f.s. &= \frac{480 \times 6 \times 25}{20 \times 10^3} \\ &= 3.6 \end{aligned}$$