

## Assignment 1

USAR, GGSIU, Delhi

Engineering Mechanics- ICT 105

Note- Assume all bodies are rigid and all surfaces are smooth.

**Problem 1-** The resultant of two concurrent forces is 1500 N and the angle between the forces is 90. The resultant makes an angle of 36 with one of the force. Find the magnitude of each force.

**Problem 2-** Figure 2.1 shows a particular position of a connecting rod BA and crank AO. At this position the connecting rod of the engine exerts a force of 2500 N on the crank pin at A. Resolve this force at point A in X & Y direction. Also resolve the given force along and perpendicular to AO.

$BA = 50 \text{ cm}$   
 $AO = 25 \text{ cm}$ .

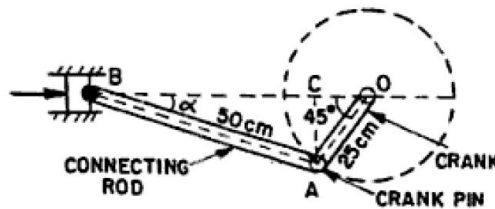


Figure 2.1

**Problem 3 –** The values of various forces are given in Figure 3.1, find out magnitude of force  $F_2$  and angle  $\theta$ .

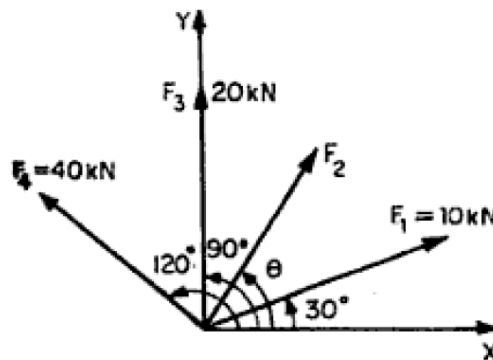
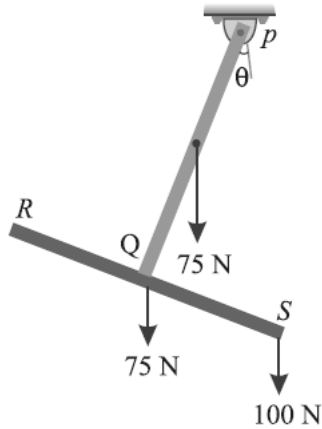


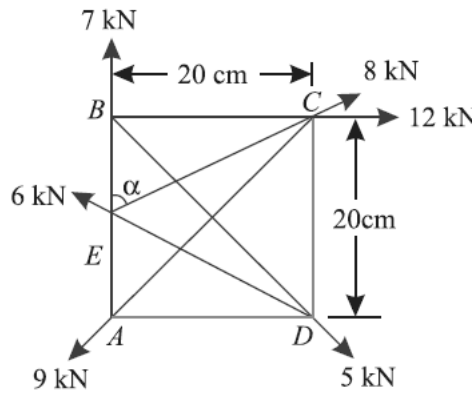
Figure 3.1

**Problem 4-** Two identical prismatic bars PQ and RS each weighing 75 N are welded together to form a T and are suspended in a vertical plane as shown in Figure 4.1. Calculate the value of  $\theta$ , that the bar PQ will make with vertical when a load of 100 N is applied at S.



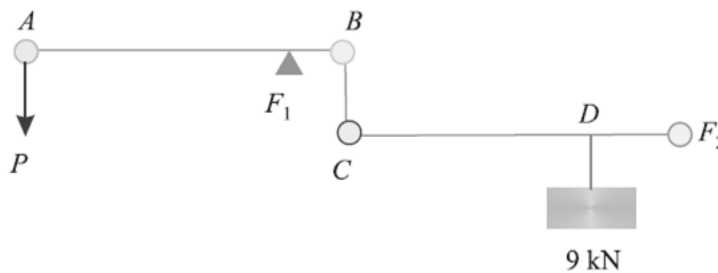
**Figure 4.1**

**Problem 6-** ABCD is a square shown in Figure 6.1, each side being 20 cm and E is the middle point of AB. Forces of 7, 8, 12, 5, 9 and 6 kN act on the lines of directions AB, EC, BC, BD, CA and DE respectively. Find the magnitude, direction and position of the resultant force.



**Figure 6.1**

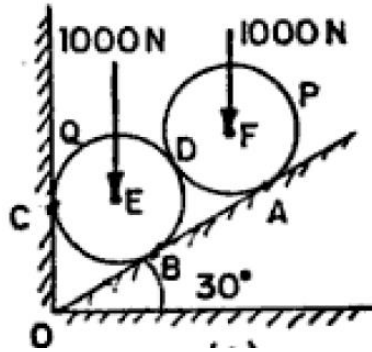
**Problem 7-** A compound lever shown in Figure 7.1 is required to lift a load of 9 kN with an effort P. The dimensions are  $AF_1 = 450$  mm;  $F_1B = 50$  mm;  $BC = 100$  mm;  $CD = 300$  mm;  $DF_2 = 75$  mm. Find the effort required to lift the load.



**Figure 7.1**

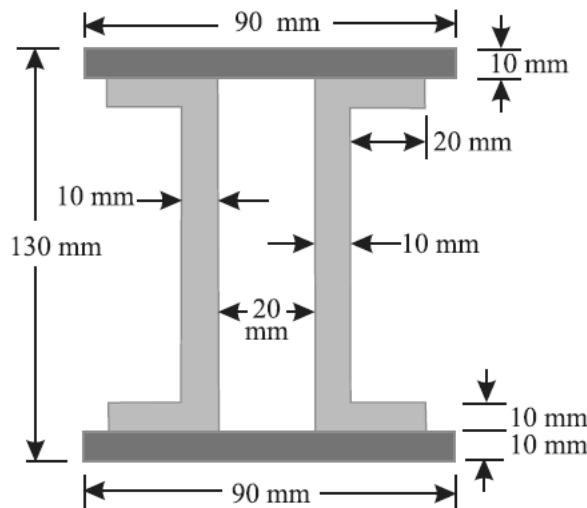
**Problem 8-** A machine component of length 2.5 metres and height 1 metre is carried upstairs by two men, who hold it by the front and back edges of its lower face. If the machine component is inclined at  $30^\circ$  to the horizontal and weighs 100 N, find how much of the weight each man supports ?

**Problem 9-** Two identical rollers, each of weight  $W=1000\text{N}$ , are supported by an inclined plane and a vertical wall as shown in Figure 9.1. Find the reactions at points of support A, B and C.



**Figure 9.1**

**Problem 10-** A built up section is made by nesting two channel sections as shown in Figure 10.1. Determine moment of inertia of a built-up section about X-X axis passing through centre of gravity of the section.



**Figure 10.1**