

Course Code: ESC106A

Course Title: Construction Materials and Engineering Mechanics

Lecture No. 30:

Problems on Beams

Delivered By: Dr. T. Valsa Ipe



Lecture Intended Learning Outcomes

At the end of this lecture, students will be able to:

- Identify the type of support and support reactions
- Apply the conditions of equilibrium
- Calculate the reactions for the beams



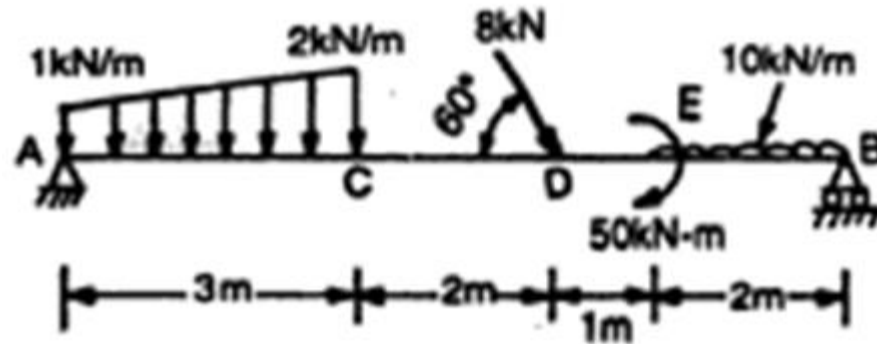
Contents

Type of support, support reactions, problems on support reactions



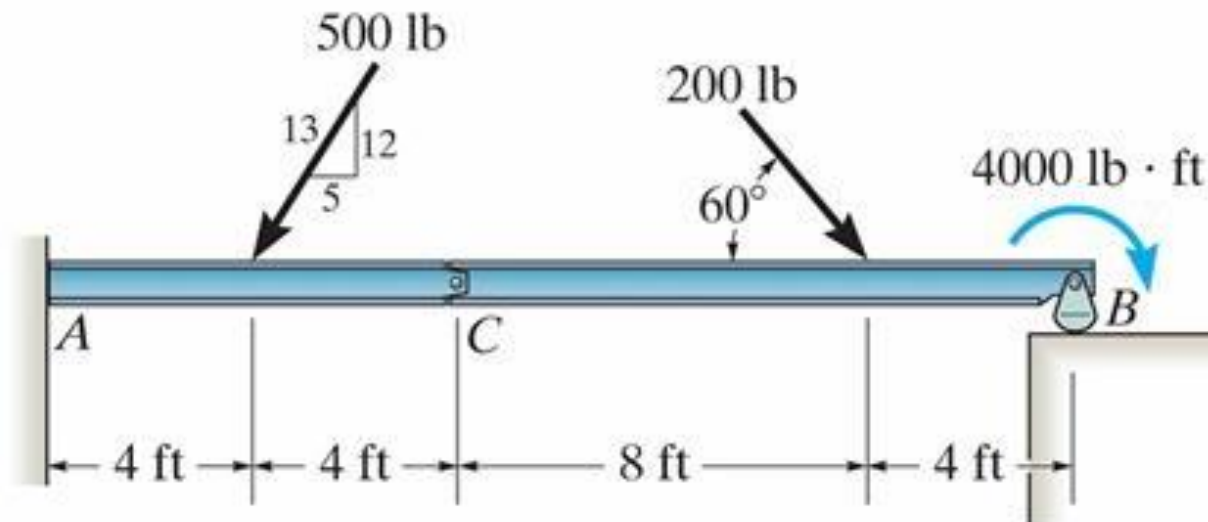
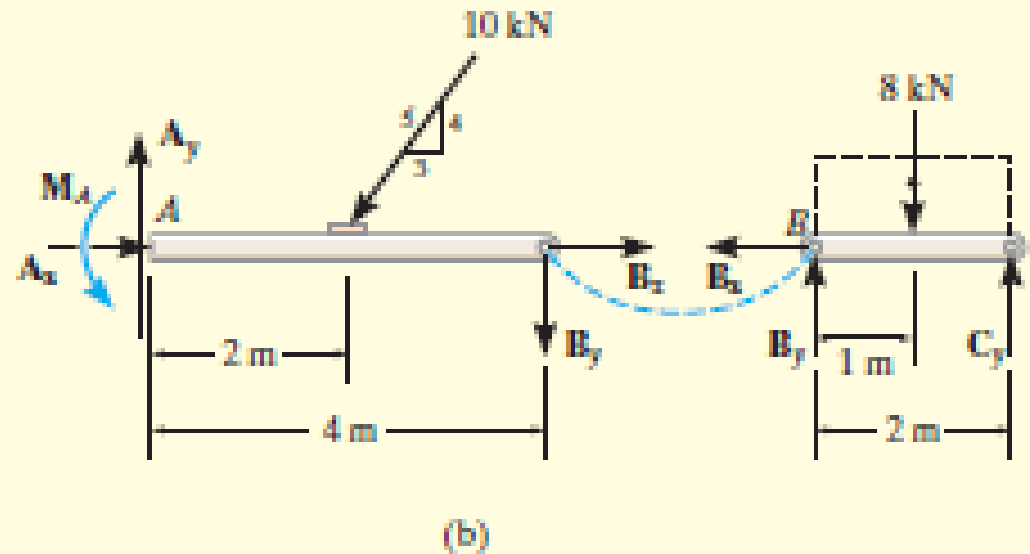
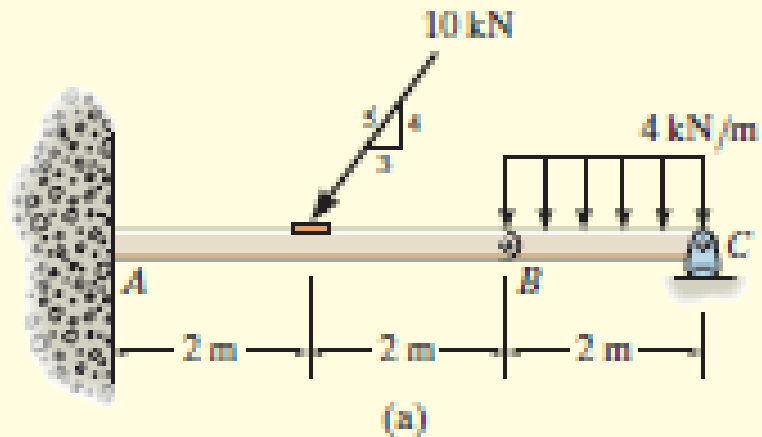
Problems on Beams

1. In the fig, the beam AB supports different types of loads. Determine the reactions at the hinge support and at the roller support



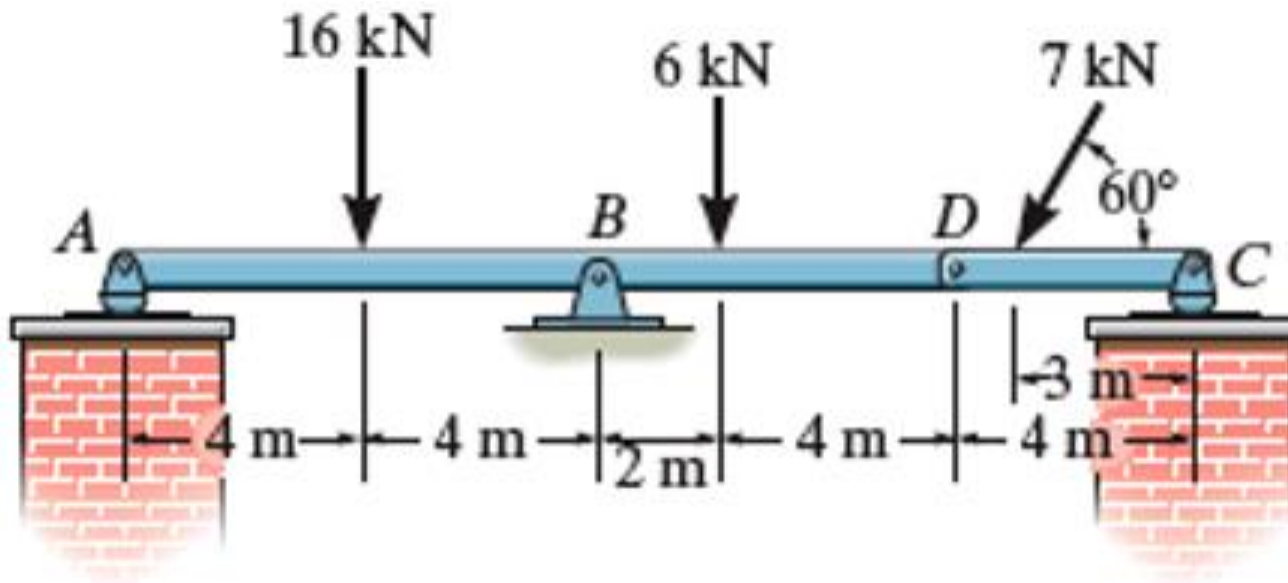
$$\begin{aligned}R_{AH} &= 4 \text{ kN} \\R_{AV} &= 2.4 \text{ kN} \\R_{BV} &= 29.02 \text{ kN}\end{aligned}$$

Compound Beams



Problems on Beams

2. The compound beam is pin-supported at B and supported by rockers at A and C. There is a hinge (pin) at D. Determine the reactions at support.



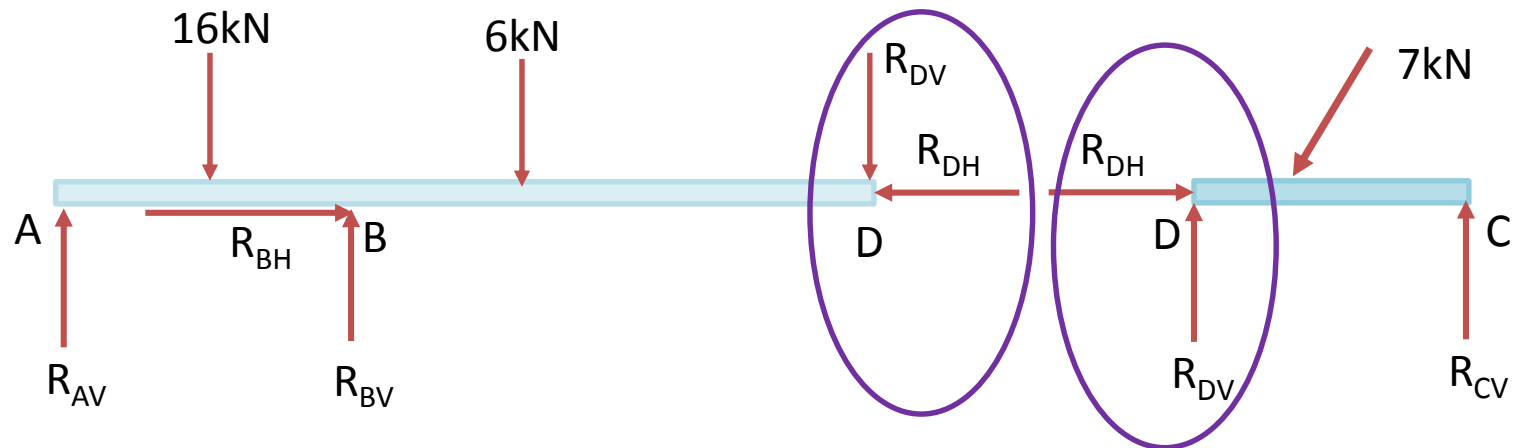
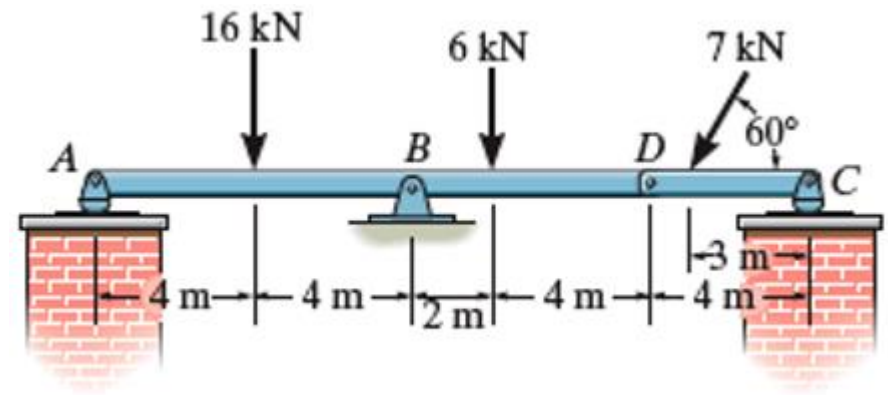
Problems on Beams

Consider beam DC:

Apply equilibrium conditions to DC

Consider beam ABD

Apply equilibrium conditions to ABD



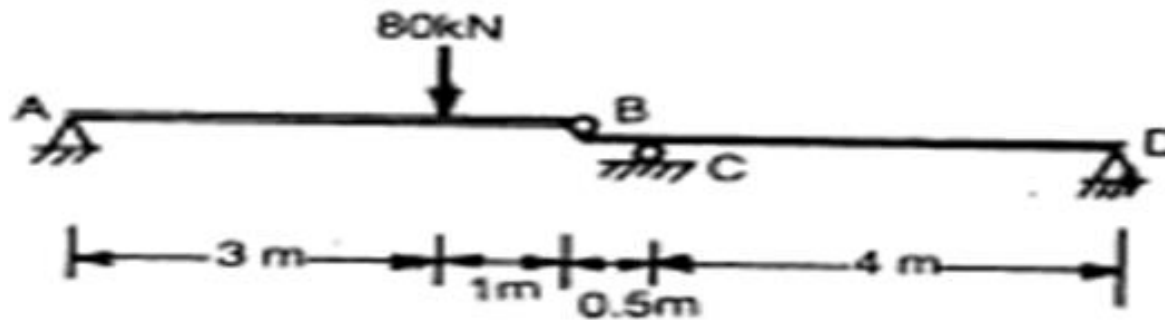
$$R_C = 1.52 \text{ kN}; R_{DV} = 4.55 \text{ kN}; R_{DH} = 3.5 \text{ kN}$$

$$R_{AV} = 3.1 \text{ kN}$$

$$R_{BH} = 3.5 \text{ kN}; R_{BV} = 23.5 \text{ kN}$$

Problems on Beams

3. Determine the reactions at supports A, B, C and D in the structure shown in the following fig



$$R_A = 20\text{kN}$$

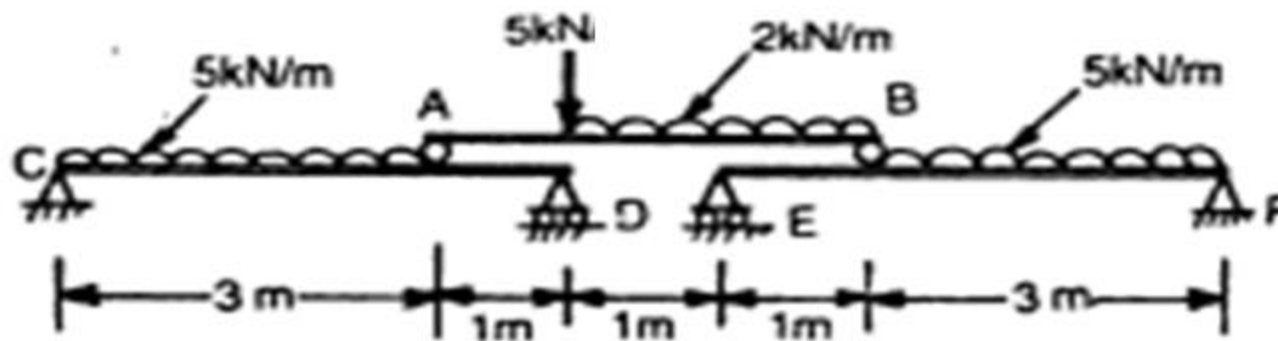
$$R_B = 60\text{kN}$$

$$R_C = 67.5\text{kN}$$

$$R_D = -7.5\text{kN}$$

Problems on Beams

4. A compound beam is loaded as shown in fig. Determine the reaction at A, B, C, D, E and F.



$$R_A = 4.67 \text{ kN}$$

$$R_B = 4.33 \text{ kN}$$

$$R_C = 10.545 \text{ kN}$$

$$R_D = 9.125 \text{ kN}$$

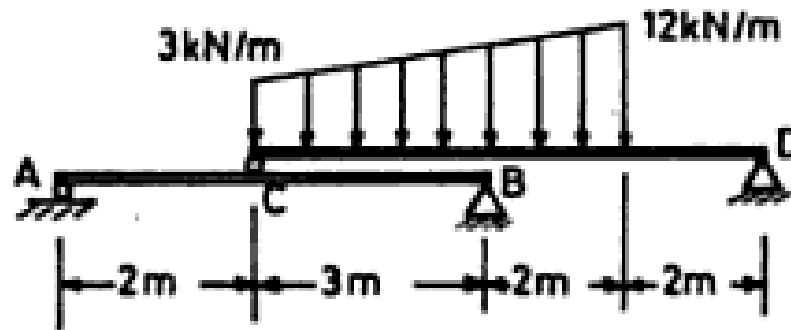
$$R_E = 8.87 \text{ kN}$$

$$R_F = 10.457 \text{ kN}$$



Problems on Beams

5. Determine the reactions at A, B, C and D in the beam shown below



$$R_A = 12.85 \text{ kN}$$

$$R_B = 8.57 \text{ kN}$$

$$R_C = 21.42 \text{ kN}$$

$$R_D = 16.07 \text{ kN}$$

Summary

- Based on the types of supports and the type of loads, the reactions developed in each support can be calculated

