ME101 Engineering Mechanics

Tutorial Sheet 03 (*Frames, Machines and Beams*)

Time: 8:00- 8:55 am **Date: 23/01/2013**

Note: Each question carries 10 Marks

Section 1: (To be discussed by the tutor)

Q. No. 1 For the frame shown in Fig. 1, determine the force supported by the roller at E.

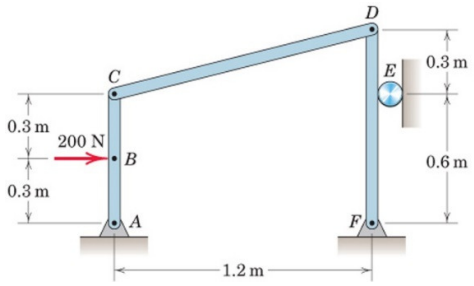


Fig. 1

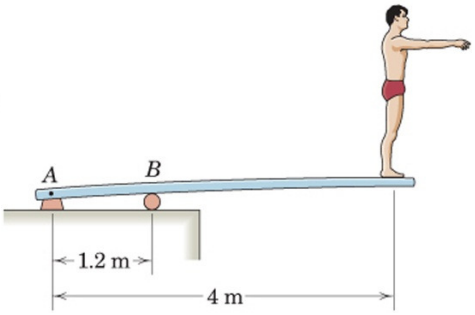


Fig. 2

Q. No. 2 Draw the shear and moment diagrams for the diving board shown in Fig. 2, which supports the 80-kg man poised to dive. Specify the bending moment with the maximum magnitude.

Section 2: Tutorial 03

Q. No. 3 Consider the Fig. 3. Given the values of the load L and dimension R, calculate the value of the couple M for which the force in link CH will be zero.

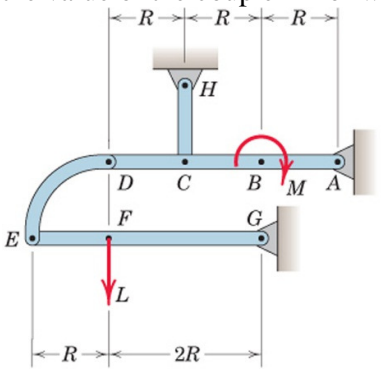


Fig. 3

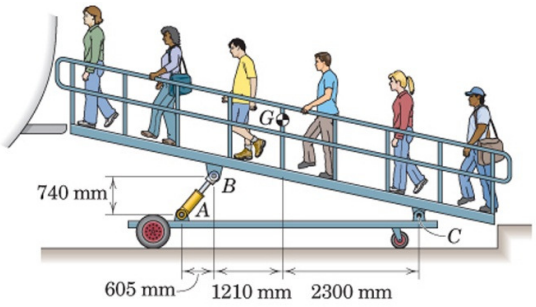


Fig. 4

Q. No. 4 The ramp (Fig. 4) is used as passengers board a small commuter airplane. The total mass of the ramp and six passengers is 750 kg with mass center at G. Determine the force in the hydraulic cylinder AB and the magnitude of the pin reaction at C.

Q. No. 5 Draw the shear and moment diagrams for the loaded beam shown in Fig. 5. What are the values of the shear and moment at the middle of the beam?

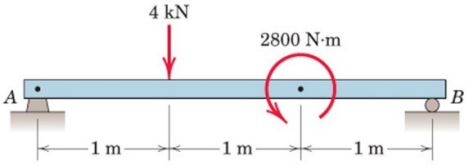


Fig. 5

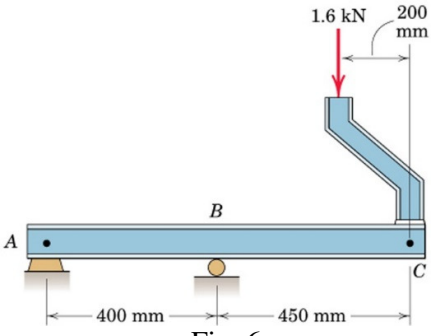


Fig. 6

Q. No. 6 The angle strut shown in Fig. 6 is welded to the end C of the I-beam and supports the 1.6-kN vertical force. Determine the bending moment at B and the distance x to the left of C at which the bending moment is zero. Also construct the moment diagram for the beam.

Section 2: Assignment 03

Q. No. 7 A horizontal 350-mm-diameter water pipe is supported over a ravine by the cable shown in Fig. 7. The pipe and the water within it have a combined mass of 1400 kg per meter of its length. Calculate the compression C exerted by the cable on each support. The angles made by the cable with the horizontal are the same on both sides of each support.

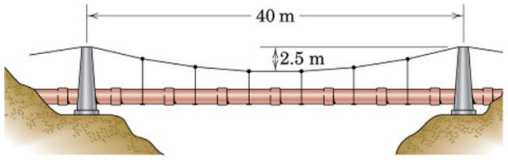


Fig. 7

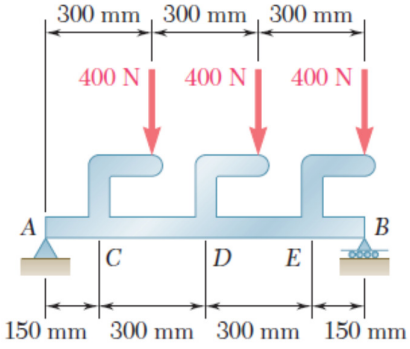
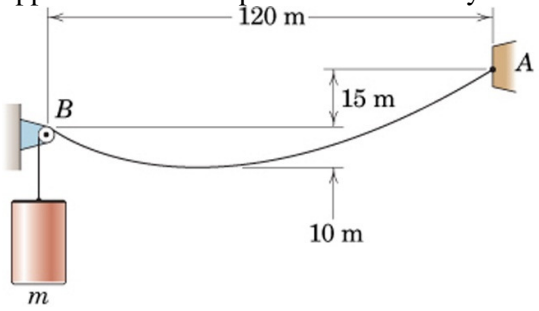


Fig. 8

Q. No. 8 Draw the shear and bending-moment diagrams for the beam AB (Fig. 8), and determine the maximum absolute values of the shear and bending moment.

Q. No. 9 A cable weighing 40 newtons per meter of length is suspended from point A and passes over the small pulley at B. Determine the mass m of the attached cylinder which will produce a sag of 10 m. With the small sag-to-span ratio, approximation as a parabolic cable may be used.



Q. No. 10 Determine the force acting on member ABC at connection A for the loaded space frame shown. Each connection may be treated as a ball-and-socket joint.