SECTION C

Answer any TWO questions from this section. Each question carries 18 marks. This section carries 36% of the total mark for this paper.

12. A steel wire is 0.10 m long and has a cross-sectional area of $0.025\ mm^2$. It is supported horizontally between two points A and B which are 0.10 m apart. A load of 175N is attached at the mid-point M of the wire. This causes M to be vertically displaced through 20 mm, as shown in Figure 7.

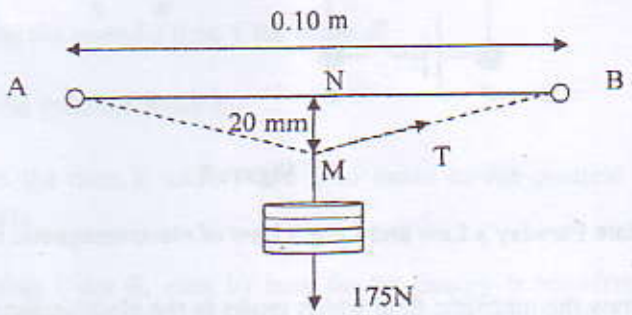

Figure 7

a. Calculate the extension of the wire when loaded as shown in Figure 7.

[4 marks]

b. Determine the angle $B\hat{M}N$ that the section of wire MB makes with the vertical.

[2 marks]

c. Sketch all the forces acting at M. By considering the forces and their components in the vertical direction, find the tension T in the wire.

[4 marks]

d. Calculate the stress that the load is exerting on the wire.

[2 marks]

e. Determine the Young modulus for steel.

[4 marks]

f. Sketch the typical graph of stress against strain for the steel wire, assuming that it has exceeded its elastic limit.

[2 marks]