1.39 Determine the equivalent stiffness of the beam of Fig. 1-41 at the location where the machine is placed.

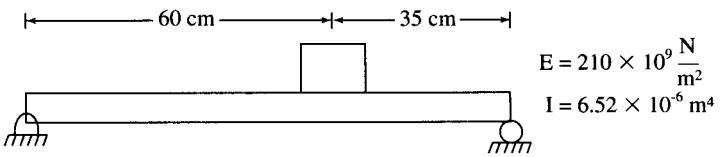

Fig. 1-41

Ans. 8.85×10^7 N/m

1.40 A helical coil spring is made from a steel ($G = 80 \times 10^9$ N/m^2) bar of radius 6 mm. The spring has a coil diameter of 6 cm and has 46 active turns. What is the stiffness of the spring?

Ans. 2.09×10^4 N/m

1.41 What is the static deflection of the spring of Problem 1.40 when it is used in the system of Fig. 1.42?

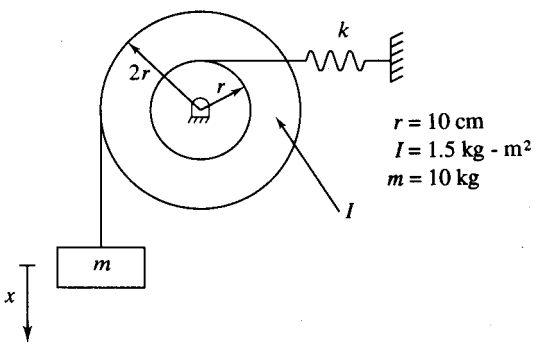

Fig. 1-42

Ans. 9.39×10^{-3} m

1.42 Determine the equivalent stiffness of the system of Fig. 1-43.

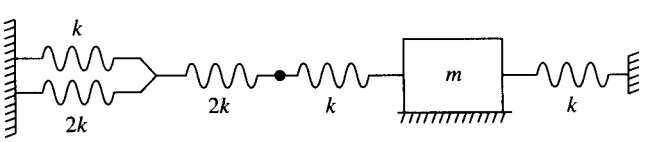

Fig. 1-43

Ans. $17k/11$

1.43 Determine the equivalent stiffness of the system of Fig. 1-44.

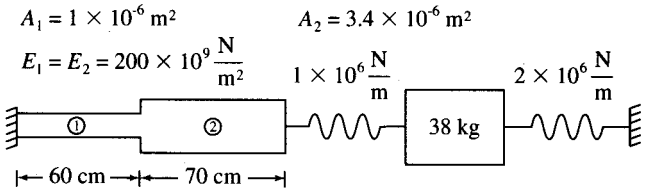

Fig. 1-44

Ans. 2.20×10^6 N/m

1.44 Determine the equivalent torsional stiffness of the system of Fig. 1-45.

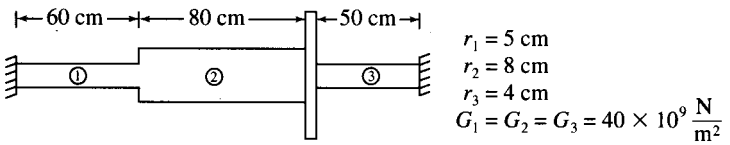

Fig. 1-45

Ans. 8.66×10^5 N-m/rad

1.45 Determine the equivalent stiffness of the system of Fig. 1-46.

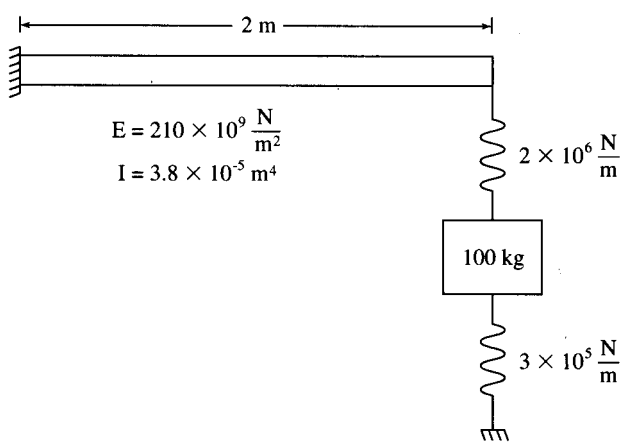

Fig. 1-46

Ans. 1.5×10^6 N/m

1.46 Determine the equivalent stiffness of the system of Fig. 1-47.

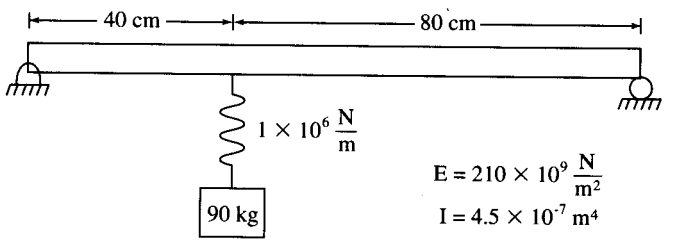

Fig. 1-47

Ans. 7.69×10^5 N/m

1.47 Determine the equivalent stiffness of the system of Fig. 1-48.

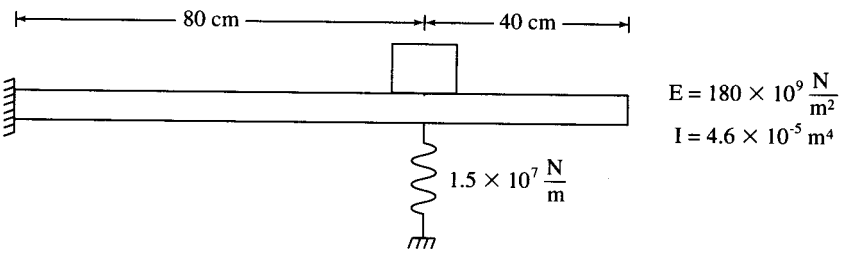

Fig. 1-48

Ans. 6.35×10^7 N/m

1.48 The torsional viscous damper of Fig. 1-49 consists of a cylinder of radius r that rotates inside a fixed cylinder. The cylinders are concentric with a clearance h. The gap between the cylinders is filled with a fluid of viscosity μ. The length of cylinder in contact with the fluid is ℓ. Determine the torsional viscous damping coefficient for this damper.

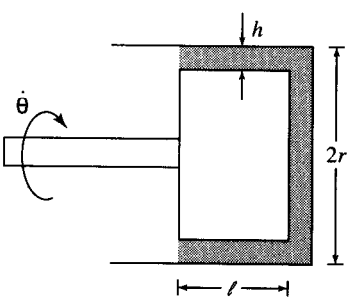

Fig. 1-49

Ans.

$$c_t = \frac{2\tau\mu r^3 \ell}{h}$$