ASSIGNMENT 3

1. A wood diving board is hinged at one end and supported 1.5m from this end by a spring with a constant of 35kN/m as depicted in figure 1. How much will the spring deflect if a young man weighing 600 N stands at the end of the board?

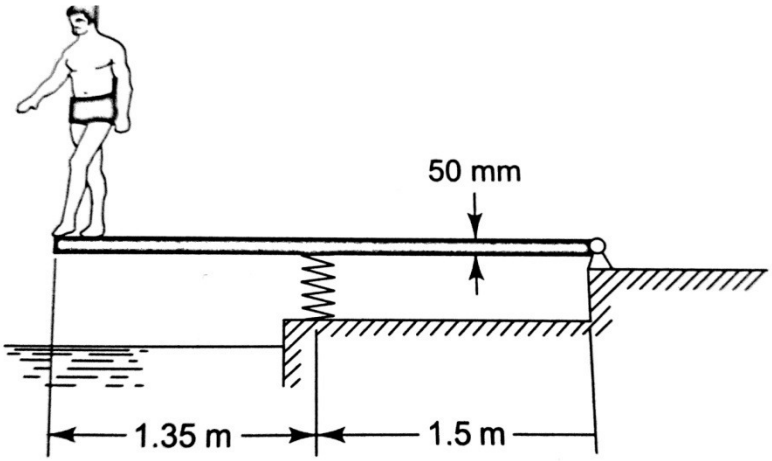

Figure 1

Options-

(a) Deflection in the spring = 22.5 mm

(b) Deflection in the spring = 32.5 mm

(c) Deflection in the spring = 42.5 mm

(d) Deflection in the spring = 52.5 mm

Correct answer – (b)

2. A 2.5 m diameter sound baffle weighing 1.1 kN is to be hung from a ceiling with three springs which are to be mounted on radii making angles of 120° with each other as shown in figure 2. Three springs, each 250 mm long are delivered to the job. Springs a and b have a spring constant of 14 kN/m and spring c one of 16 kN/m. If the springs a

and b are mounted 1m from the center, how far from the center should the spring c be mounted if the sound baffle is to hang level.

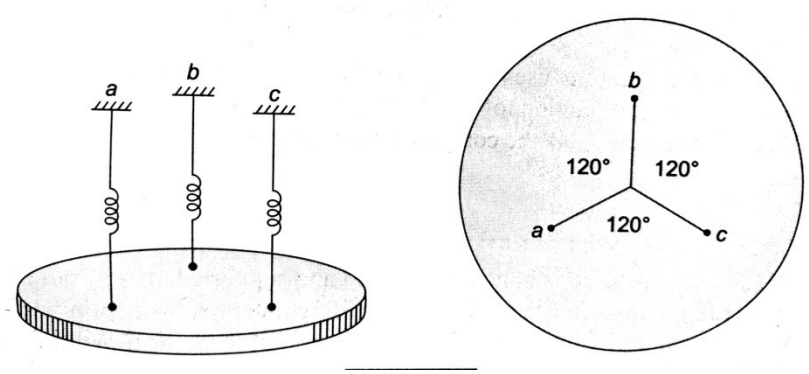

Figure 2

Options-

(a) Distance of spring c from the center = 0.575 mm

(b) Distance of spring c from the center = 0.675 mm

(c) Distance of spring c from the center = 0.775 mm

(d) Distance of spring c from the center = 0.875 mm

Correct answer – (d)

3. A small railroad bridge is constructed of steel members, all of which have a cross sectional area of 3250 mm^2. A train stops on the bridge, and the loads applied to the truss on the side of the bridge are as shown in the sketch. Estimate how much the point R moves horizontally because of the loading. Take E_s = 207 Gpa.

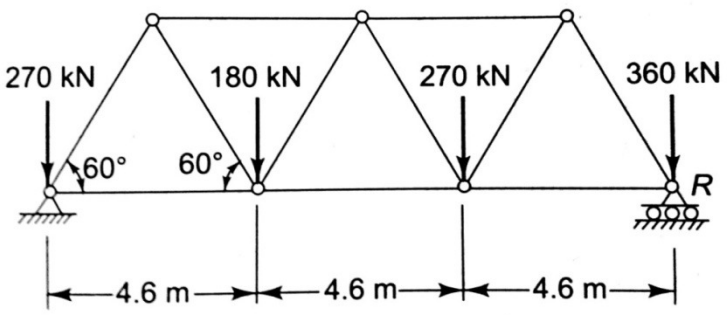

Figure 3

(a) 2.6 mm

(b) 3.6 mm

(c) 4.6 mm

(d) 5.6 mm

Correct answer – (b)

4. Consider the pin connected framework loaded as shown in the figure 4. Find the axial force in each bar. The two outer bars are identical with cross sectional area $A_{o;}$ the inner bar has a cross sectional area A. All bars have the same modulus of elasticity. If F1 is the force in the inner bar, F2 and F3 are forces in the outer bars find the axial forces. Take F = 500 kN, $\theta = 60°$, A = 1000 mm^2, A_o = 900 mm^2. Assume for small deflections angle will be constant.

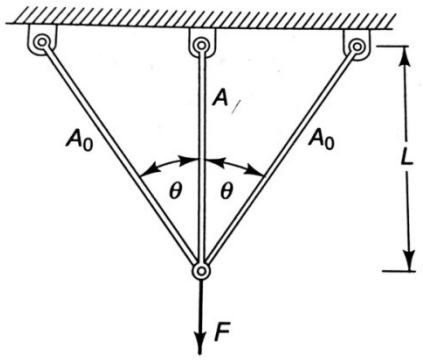

Figure 4

(a) F1 = 308 kN, F2 = F3 = 92 kN.

(b) F1 = 408 kN, F2 = F3 = 82 kN.

(c) F1 = 808 kN, F2 = F3 = 92 kN.

(d) F1 = 308 kN, F2 = F3 = 72 kN.

5. A stiff horizontal bar AB is supported by three springs with different spring constants, arranged as shown in figure 5. With bar AB horizontal, under the load P (1 kN), how much does the bar move down. The spring stiffness are k1 = 50 kN/m = k2, k3 = 100 kN/m and load P = 1kN.

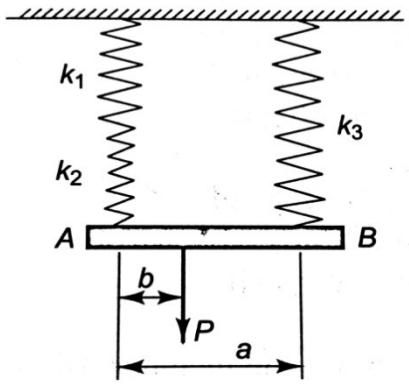

Figure 5

(a) Deflection – 6mm.

(b) Deflection – 8mm

(c) Deflection – 10mm

(d) Deflection – 12mm

Correct Answer – (b).

6. A brake is designed as shown. A 25 x 1.5 mm steel band restrains the wheel from turning when a 225 N-m torque is applied. The friction coefficient is 0.4. Find the tensions T1 and T2 that just keep the wheel from rotating.

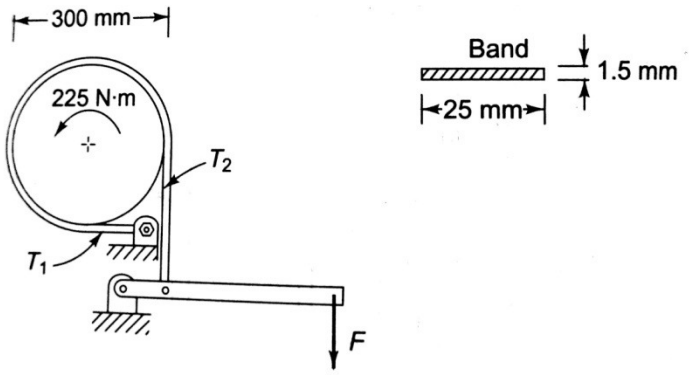

Figure 6

(a) T1 = 268.5 N and T2 = 1768.5 N

(b) T1 = 368.5 N and T2 = 1868.5 N

(c) T1 = 168.5 N and T2 = 1668.5 N

(d) T1 = 268.5 N and T2 = 1568.5 N

Correct – (a)

7. A composite hoop consists of a brass hoop of 300 mm internal radius and 3 mm thickness, and a steel hoop of 303-mm internal radius and 6-mm radial thickness. Both hoops are 6-mm thick normal to the plane of the hoop. If a radial pressure of 1.4 MN/m^2 is put in the brass hoop, estimate the tangential forces in the brass and steel hoops.

   Take E_B = 103 Gpa, E_s = 205 Gpa. Consider thin hoop.

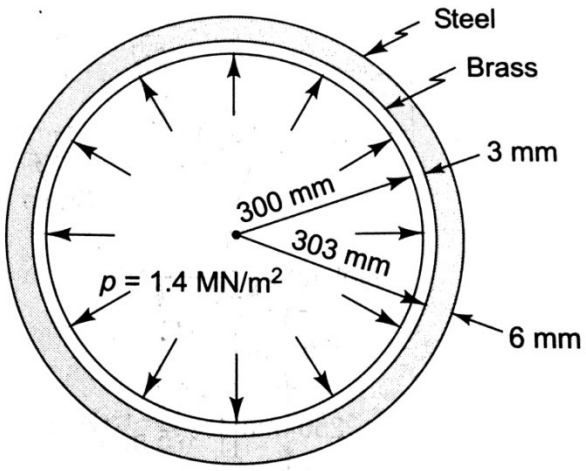

Figure 7

(a) Tangential forces in brass and steel are 414 N and 2027 N respectively

(b) Tangential forces in brass and steel are 514 N and 2027 N respectively

(c) Tangential forces in brass and steel are 414 N and 3027 N respectively

(d) Tangential forces in brass and steel are 514 N and 3027 N respectively

Correct answer – (b).