Table 1. Static Determination of the Spring Constant, k

Position of the lowest point of the spring, $X_0 =$ 0.145 (m).

$g = 9.81\ m/s^2$

Mass Added to the spring (kg)	Force, F (N)	Spring position, X (lowest point) (m)	Elongation, $L = \lvert X - X_0 \rvert$ (m)
~~0.050~~ 0.100	0.981	0.355	0.210
~~0.060~~ 0.200	1.962	0.480	0.335
~~0.070~~ 0.300	2.943	0.608	0.463
~~0.080~~ 0.400	3.924	0.735	0.590
~~0.090~~ 0.450	4.4145	0.800	0.655
~~0.100~~ 0.500	4.905	0.860	0.715

Spring constant: 7.647 N/m

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0.420 - 0.250}{2.6 - 1.3}$

$k = \frac{1}{m} = \frac{1}{0.1307} = 7.647$

Table 2. Spring mass determination

Length of the spring (Horizontal), L_h (cm)	11.00
Length of the spring (vertical), L_v (cm)	11.00
Extension of spring length, $\Delta L = \lvert L_h - L_v \rvert$ (cm)	0.85
Effective mass of the spring, m (kg)	0.66
Actual mass of the spring, M (kg)	0.95
Ratio of the masses, m/M	0.88

$m_s = \frac{K[L_V - L_H]}{g}$

$= \frac{7.647 \times 0.85}{9.81}$

$= 0.66$

QUESTIONS:

1. To what extent does your graph agree with Hooke's Law?

The graph completely agrees with Hooke's Law. Hooke's law states that the spring displacement should be proportional to the force, which is $F \propto X \Rightarrow F = -Kx$. The graph is of a straight line just like the law. The y intercept is the effective mass.

2. How does your calculated and measured values of the spring mass compare?

The calculated and measured effective mass differs by 9%. The ratio of their mass is 0.88. This means they are quite close in values.

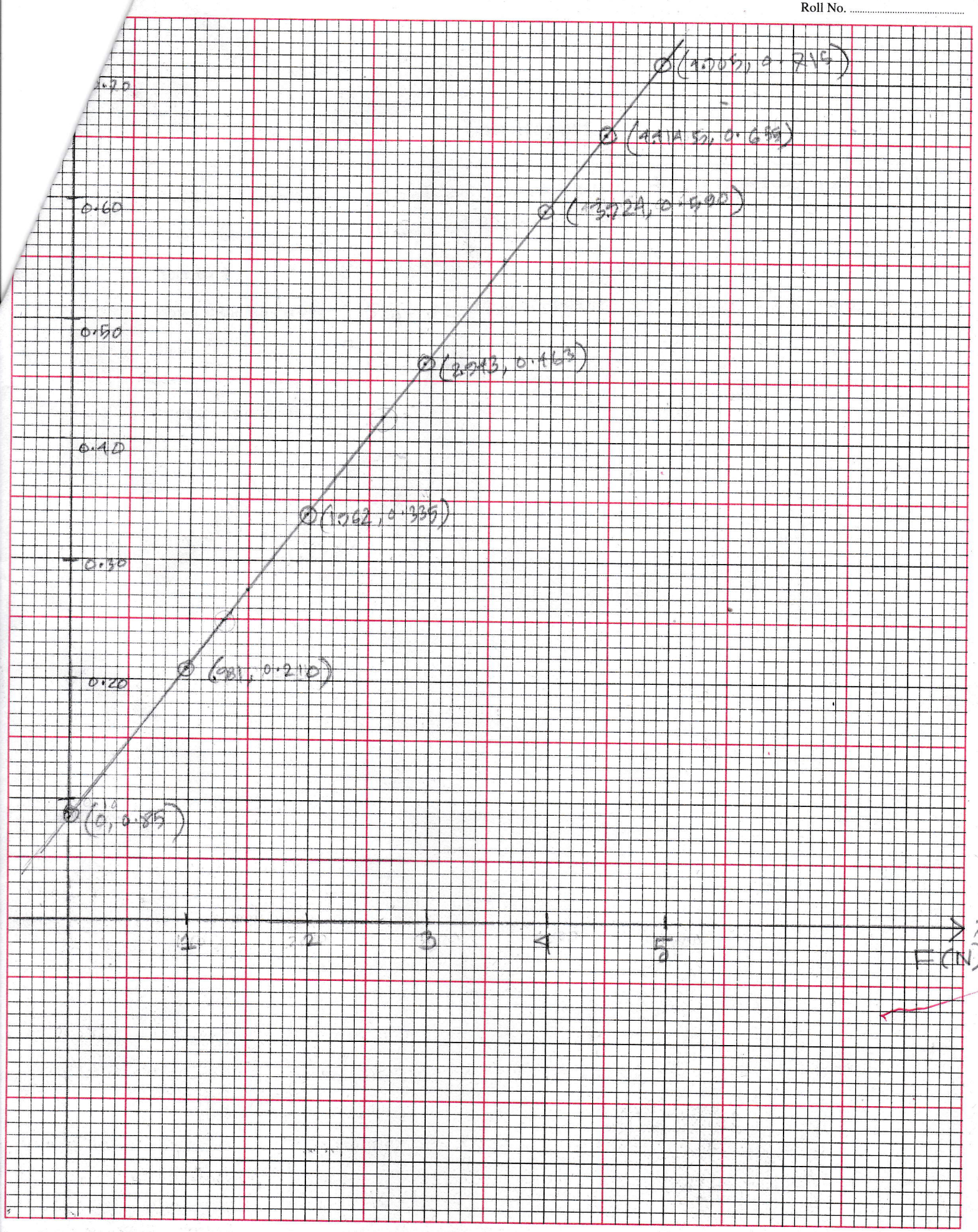
3. Did the graph passes through the origin? If not, interpret the meaning of the y-intercept.

The graph did not pass through the origin because of the effective mass of the spring. Otherwise it would have passed through the origin

4. From your understanding of the Hook's law and the graph you plotted, explain why the position of the equilibrium does not effect the graph.

The equilibrium doesn't matter because we are interested in the displacement of the spring. The displacement depends on the force and spring constant. That's why the graph is linear and that's why the equilibrium position doesn't effect the graph.

Roll No. .....



8 Inch x 10 Inch

F vs m