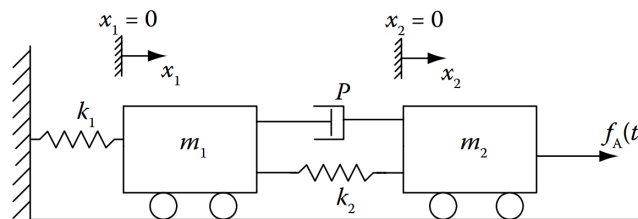
	Course:	Computer Modeling and Simulation	Course Code:	CS-421
	Program:	BS(Computer Science)	Semester:	Spring 2017
	Duration:	1 hour	Total Marks:	50
	Paper Date:	20 th February, 2017	Weight:	15%
	Section:	All	Page(s):	1
	Exam:	Mid-1	Roll No.	

Instructions/Notes: Write answers clearly and precisely, if the answers are not easily readable then it will result in deduction of marks.

Question 1 (30 points): In the following diagram a mechanical system is drawn. Develop a mathematical model of this system.

- Draw the relevant Free Body Diagram of the system.
- Each term you put in this mathematical model, explain its meaning and purpose. (Missing explanation of any term will lead to deduction of marks.)



Question 2 (8 points): If V is a vector space and $\mathbf{v}, \mathbf{w} \in V$ and s is a real number, then which of the following statements are true or false. Give **reason** for each

- (a) $s\mathbf{v} + s\mathbf{w} \in V$ (c) $s^2\mathbf{v} + s^2\mathbf{w} \in V$
 (b) $s\mathbf{v} \times s\mathbf{w} \in V$ (d) $s\mathbf{v}^2 \in V$

Question 3 (4 points): Suppose $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3$ are three vectors of a matrix \mathbf{A} . All vectors are linearly independent. Now tell the size of its kernel space. Give **reasons**.

Question 4 (4 points): If matrix A is $n \times n$ identity matrix then eigenvectors of A form a basis of R^n , how and why?

Question 5 (4 points): Following is a matrix A , where s is a real number. Tell one of its eigenvalues.

$$A = \begin{pmatrix} s & 0 & 0 \\ 0 & s & 0 \\ 0 & 0 & s \end{pmatrix}$$