BURSA TECHNICAL UNIVERSITY
INSTITUTE OF NATURAL AND APPLIED SCIENCES
DEPT. OF MECHANICAL ENGINERING

STUDENT NAME:	
COURSE TITLE:	MECH 603 Advanced Mechanical Vibrations
ASSIGMENT TITLE:	Deriving equations of motion
ASSIGMENT NUMBER	1

ISSUE DATE	**30 OCT 2013**	**DEADLINE DATE**	**19 NOV 2013**	**SCORE**	

LECTURER NAME: Assist. Prof. Dr. Hakan Gökdağ **SIGNED: …………………………**

DATE:…………………

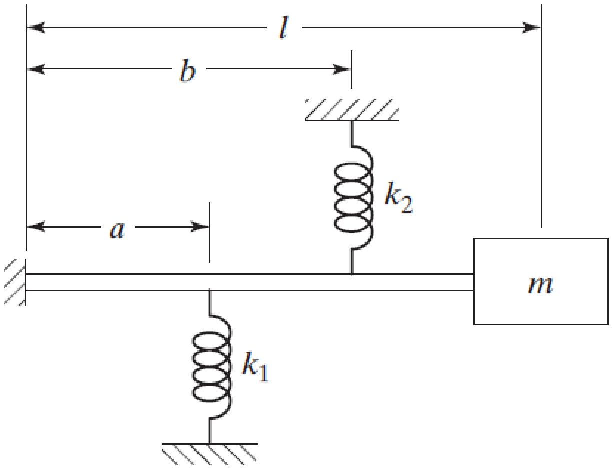
Student declaration: (must be signed before submission)

I declare that this assignment is my own work

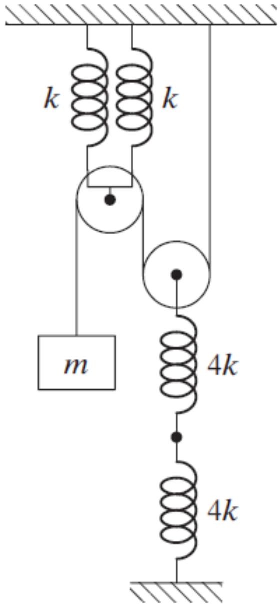
Student signature: …………………… Date : ………………..

Please solve the following problems giving sufficient explanations.

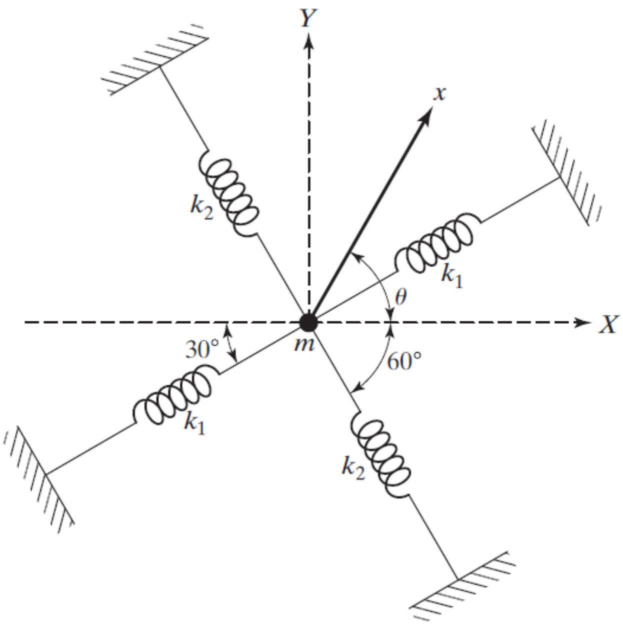
(1) Derive the equation of motion, for small displacements, of these single-DOF systems, using: (i) Newton's 2nd law of motion, (ii) Lagrange's equations. Note: The masses of rigid rod at (a), and the pulleys at (b) are negligible.



(a)

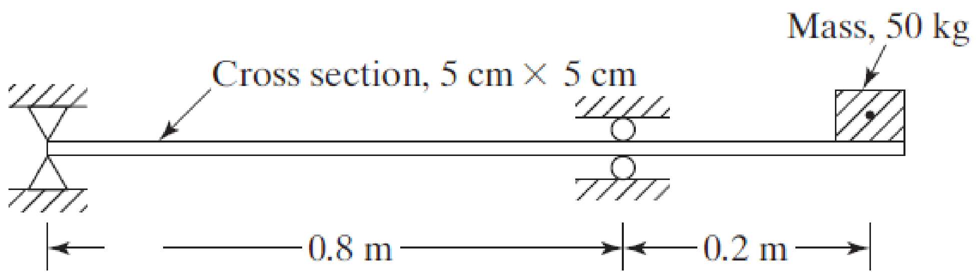


(b)

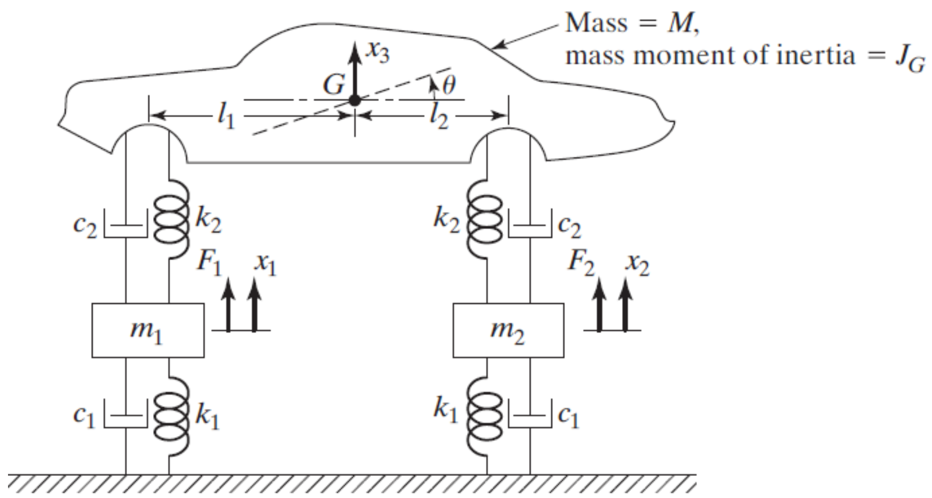


(c)

(2) A steel beam of length 1 m carries a mass of 50 kg at its free end, as shown in the following figure. Derive equation of motion for vertical motion of the system by modeling it as a single-degreeof - freedom system.



(3) Half car model of a vehicle is as shown. Derive equations of motion of the system by (i) Newton's approach, (ii) Lagrange equations.



(4) Using Hamilton's principle derive equation of motion for the vertical vibrations of the beam along with suitable boundary conditions. Note that the beam is supported by a torsional spring (k_t) at the left end, and a linear spring (k) at the right side.