

GUJARAT TECHNOLOGICAL UNIVERSITY
ME Semester –I Examination Feb. – 2012

Subject code: 711104N**Date: 15/02/2012****Subject Name: Modeling, Simulation and Computer Application****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain system modeling and simulation as applied to Mechanical Engineering. **04**
(b) Give detailed classification of (i) Systems and (ii) Models. **10**
- Q.2** (a) Explain RLC circuit and its importance. Write a program for showing the effect of circuit parameters. Give resembling practical mechanical system. **07**
(b) Describe Monte Carlo simulation technique with a suitable example. **07**
- OR**
- (b) Describe the idealized rotational and translational passive elements, used for modeling, giving their basic governing mathematical representation. **07**
- Q.3** (a) For the system as shown in figure 1, write system equations and get transfer function form. **07**
(b) Draw a state diagram for the system of Q.3(a) above and make a Simulink block model **07**
- OR**
- Q.3** (a) Give different models for generating random variables. **05**
(b) Explain the significance of analyzing an automobile suspension system. Make an appropriate model and write system equations with state space representation for the physical model of simplified suspension system as shown in figure 2. **09**
- Q.4** (a) Make a state space model only for the system shown in figure 3. **08**
(b) Get the transfer function form of the same system used in Q.4(a) above and write a MATLAB program for the same. **06**
- OR**
- Q.4** (a) Make a model of any one thermo-mechanical system. **06**
(b) Model a DC motor for predicting its performance. Write system equations and draw state diagram. Write a MATLAB program for the same. **08**
- Q.5** (a) Explain the use of probability in simulation. Describe the following probability density function and cumulative distribution function: (i) Binomial distribution (ii) Exponential distribution, (iii) Poisson's distribution and (iv) Gamma distribution. **08**
(b) Model and simulate mechanical accelerometer to obtain the characteristics in terms of the response of the same. **06**
- OR**
- Q.5** (a) Make a model for an inverted pendulum mounted on a moving cart. Derive system equations and write a MATLAB program, if the pendulum is constrained using a pivot in the vertical plane. **08**
(b) For the truck trailer system shown in figure 4, write system equations and hence get only the transfer function form, if mass of truck is M_1 . **06**

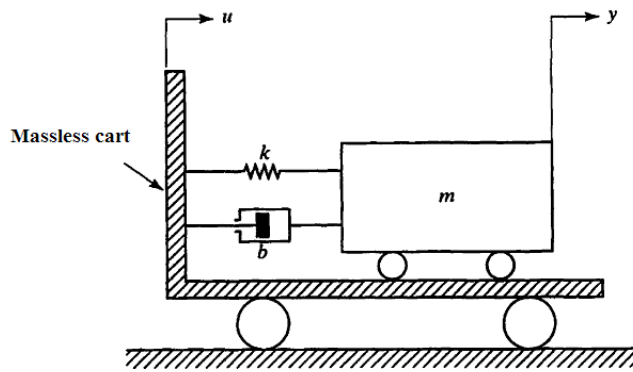


Figure 1 [Q. No. 3(a)]

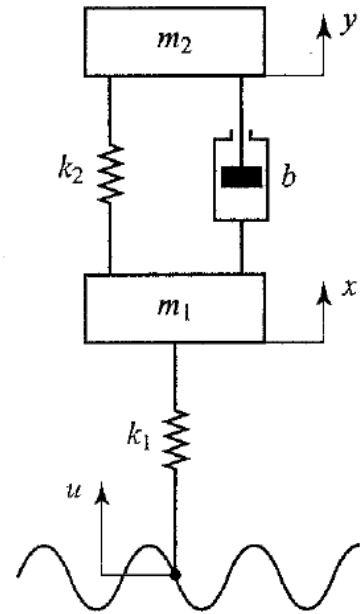


Figure 2 [Q. No. 3(b) **OR**]

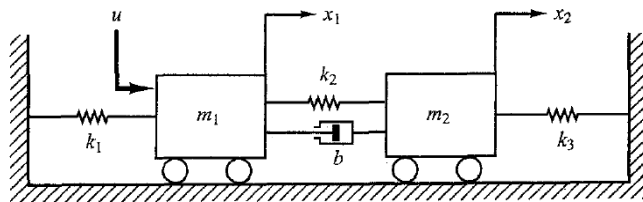


Figure 3 [Q. No. 4(a)]

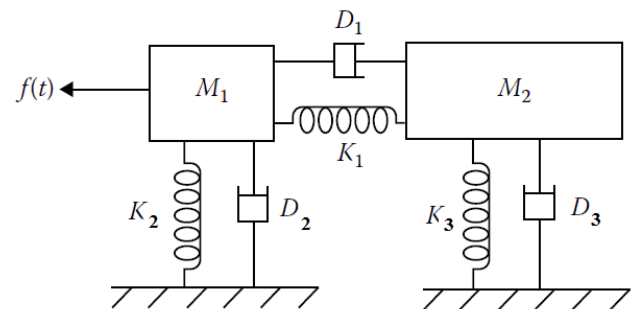


Figure 4 [Q. No. 5(b) **OR**]
