Date of Examination
03 - 12 - 2020

No of Questions	05
No. of Pages	03

GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY

BACHELOR OF SCIENCE IN COMPUTER SCIENCE DEGREE PROGRAMMES

INTAKE 35 - 6TH SEMESTER EXAMINATION
NOVEMBER/DECEMBER 2020

(Stream: Computer Science)

Modelling and Simulation

(CS 3182)

Instructions: **Duration:** 02 Hours

This paper has **5 Questions**.

Answer **ALL** Questions.

All questions carry **equal** weight and *standard notation is used throughout the paper.*

All computations must carryout using **MATLAB** software.

---

1. (a) What is the purpose of a model?

   (b) List down the main two types of models. Give two examples under each model.

   (c) Write down advantages and disadvantages when modeling with general purpose languages.

   (d) What are the real cost of simulation.

2. For each of the following situations, create a mathematical model using a difference equation or a differential equation.

   (a) The population of a city grows at an annual rate of 1.5%.

   (b) A radioactive sample losses 4.5% of its mass every day.

   (c) You have a bank account that earns 10% interest every year. At the same time, you withdraw money continually from the account at the rate of Rs.10000 per year.

3. Recall that in a spring-mass system Newton's second law gives:

$$my'' = F_r + F_d$$

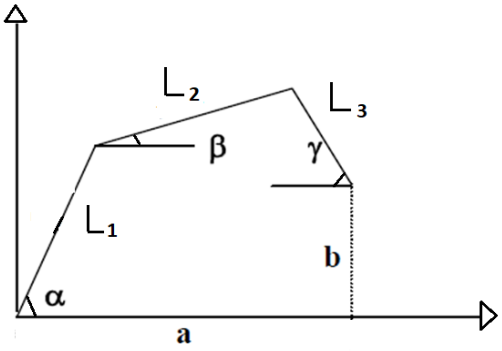
where m is the mass, F_r is the restoring force (which is proportional to the displacement), and F_d is the damping force (which is proportional to the velocity).
Hence, the motion is governed by the equation

$$my'' + by' + ky = 0.$$

Consider spring-mass system with mass $m = 1kg$, damping force $b = 3kg/s$, and restoring force $k = 2N/m$. If $y(0) = 1$ and $y'(0) = 0$ then find the function modeling the position $y(t)$.

4. There are 3 classes of paddy: short grain, medium grain, long grain. Given 3 bundles of short grain paddy, 2 bundles of medium grain paddy and 1 bundle of long grain paddy, the yield is 140 kg. For 2 bundles of short grain, 3 bundles of medium grain and 1 bundle of long grain, the yield is 160 kg. And for 1 bundle of short grain, 2 bundles of medium grain and 3 bundles of long grain, the yield is 150 kg. How much does one bundle of each grain yield?

5. Consider the three bar linkage mechanism shown below. For a constant rotation rate ω of link L_1, determine and plot the angular velocities and accelerations of links L_2 and L_3 for one cycle of rotation of L_1. Choose L_1, L_2 and L_3 as 0.5m, 1m and 1.5m respectively. Also choose 'a' and 'b' as 0.5m and 0.6m respectively. The angular velocity, ω of link L_1 is chosen to be 2 rad/sec.



— END OF THE PAPER —