Aerospace Engineering Department, IIT Bombay
AE 308 & AE 775 - Control Theory
Tutorial 1

Q1

Classify the given below systems as open-loop or closed-loop systems

1. Ceiling fan with speed control.
2. Automatic electric iron.
3. Air conditioners.
4. Timer based toasters.
5. Cruise control in a car.

Q2

A temperature control system operates by sensing the difference between the thermostat setting and the actual temperature and then opening a fuel valve an amount proportional to this difference. Draw a closed-loop block diagram identifying the input and output transducers, the controller, and the plant. Further, identify the input and output signals of all subsystems previously described.

Q3

Write state-space model for the spring mass damper system shown in Fig.1, where $z(t)$ is displacement of the mass, k is spring constant, b is damping coefficient, and $f(t)$ is the external force applied on the mass.

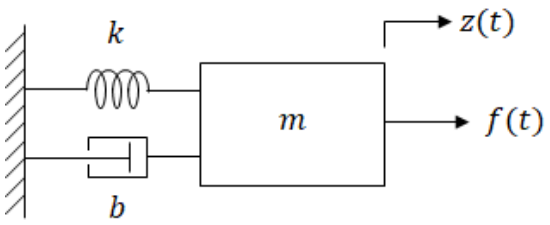

Figure 1: Spring Mass Damper System

Q4

Determine the state-space equations for the circuit shown in Fig.2.

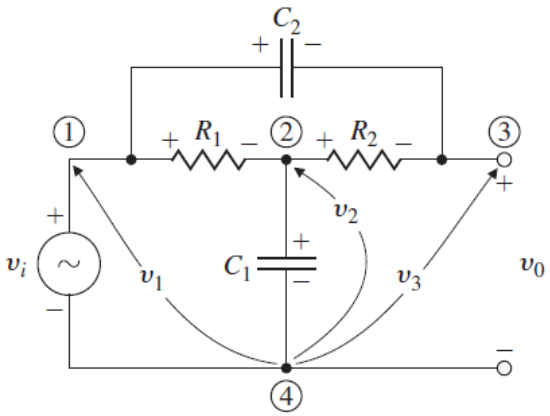

Figure 2: Bridged Tee Circuit