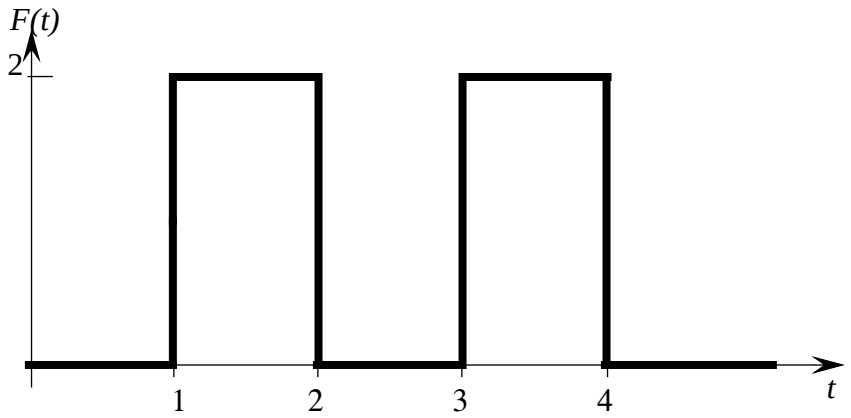
ME 460/660 Exam 2, Fall ‘95

1) Find the Fourier series representation of the following function. (25 points)



2) Find the natural frequencies and mode shapes of the following system: (25 points)

$$M = \begin{bmatrix} 9 & 0 \\ 0 & 9 \end{bmatrix}$$

$$K = \begin{bmatrix} 4 & -1 \\ -1 & 4 \end{bmatrix}$$

3) A 100 kg motor is purchased by your company to drive the “Walleygag Mechanism”. The manufacturer of the motor guarantees that the shaft is balanced such that $em_0 < 0.0001$ kg-m. Assuming that the coupling between the motor and the “Walleygag Mechanism” provides negligible stiffness and damping, design a table for the motor that will keep its displacement below 1 mm for motor speed between 0 and 2000 rpm under normal operation. Sketch your table design, including dimensions. Choose a proper material and maintain a low cost. Be concerned that the design criteria is fixed, but that the limits of operation may not be completely accurate. Neglect the mass of the table. (50 points)