



QUESTION (1)

Write a MATLAB script file .m that can calculate

$$\sum_{n=1}^{100000} \frac{1}{n^2}$$

- A. Using for loops
- B. Using vectorizing

QUESTION (2)

Five strings have the following fitness values: 3, 6, 9, 12, and 15. Under Roulette wheel selection, compute the expected number of copies of each string in the mating pool if a constant population size, n=5, is maintained.

QUESTION (3)

- A. Assume that each value in [-1.0, 4.1] is encoded as a binary representation with precision to three decimal places. Find the binary representation of 1.234.
- B. Draw a flowchart that implements the main steps of a genetic algorithm
- C. What is the velocity update rule in PSO?

QUESTION (4)

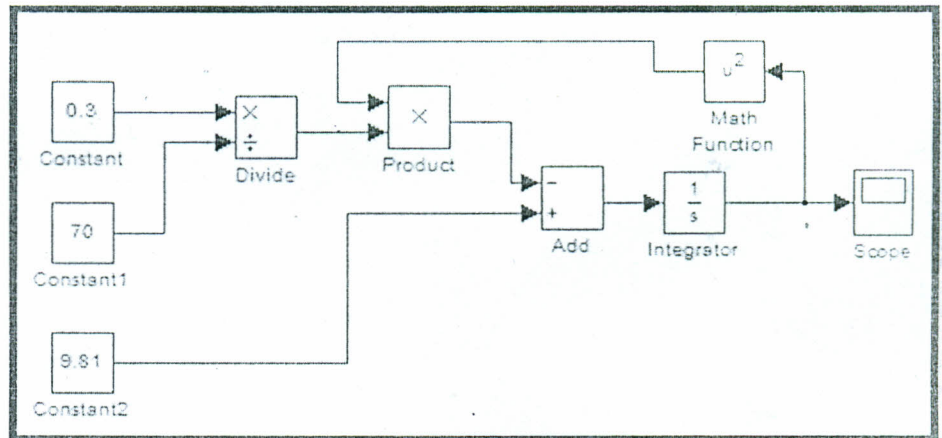
If the model shown is used to model the equation

$$\frac{dv}{dt} = g - \frac{c}{m} v^2.$$

Use this prototype to model the

$$\text{equation } \frac{d^2v}{dt^2} = g - \frac{c}{m} v$$

Where $g = 9.81 \text{ m/s}^2$, $m = 70 \text{ kg}$, $c = 0.3 \text{ kg/m}$



QUESTION (5)

In the DNA double helix, two strands twist together and “face” each other. The two strands are reverse complementary. i.e., reading one strand in reverse order and exchanging each base with its complement gives the other strand. A and T are complementary; C and G are complementary. For example, given the DNA sequence AGTAGCAT the reverse sequence is TACGATGA so the reverse complement is ATGCTACT Write a function rComplement(dna) to return the reverse complement of a DNA strand.

QUESTION (6)

- A. The simplest syntax to solve any differential equation, common to all the solver functions, is $[t, y] = \text{solver}(\text{odeFun}, \text{tspan}, \text{y0}, \text{options})$, define each of these parameters
- B. Solve the first-order differential equation $(t^2 + 1)\bar{y}' + 2ty = 0$, subject to the initial condition that $y(0) = 1$ over the range $t \in [0, 5]$.