Please select **only one** of the answers for each question. Place the answer on the problem and the table above.

1. In an R10 series, what is the ratio between every term and the following term in the series?

   a) 1.0593  
   b) 1.1220  
   c) 1.2589  
   d) 1.5848  

2. The standard/preferred elevator rated speeds follow an R10 series. Which of the following is NOT a standard elevator speed?

   a) 1.60  
   b) 2.50  
   c) 3.00  
   d) 4.00  

3. A building has 18 floors above the main entrance (the ground floor). If all floor heights are equal at 3.6 m, and based on a 30 second travel time between terminal floors, what is the recommended speed? Assume that the rated acceleration is 1 m/s/s and the rated jerk is 1 m/s/s/s.

   a) 1.60 m/s  
   b) 2.00 m/s  
   c) 2.50 m/s  
   d) None of the above  

4. A building has 3 entrance floors (2 car parks below the ground floor and the ground floor as a main entrance). It also has 9 occupant floors. What are the dimensions of the kinematics matrix?

   a) 3 rows by 9 columns.  
   b) 12 rows by 12 columns.  
   c) 12 rows by 9 columns  
   d) 9 rows by 3 columns.  

5. Which of the following is NOT true of the kinematics matrix?

   a) Its depends on the population in the building.  
   b) It is a square matrix.
c) It is equal to its transpose.
d) The diagonal is always equal to zero.

6. An elevator has a rated speed of 4 m/s. How long would it take to traverse a journey of 8.75 m (starting from standstill and ending at standstill), assuming that the rated acceleration is 1 m/s/s and the rated jerk is 1 m/s/s/s/s?
   a) 3 s.
   b) 7 s.
   c) 8 s.
   d) 10 s.

Building for Problems 7 to 10.
A building has a single entrance (Ground floor) and 6 occupant floors above ground (L1 to L6) with equal floor populations and equal floor heights ($d_f = 4.2$ m). The population per floor is 100 persons.

Carry out a HARint Plane design and use a graphical method to solve it (instead of using a large number of iterations). Use the millimetric graph paper provided to draw the HARint Plane. Draw a straight line between the first two points of the design in order to find the final iteration that intersects with the AR% line.

The user requirements are: Arrival rate (AR%) 12%; the target interval (INTtar) 30 seconds. Use the following values:
- Door opening time: 2 s
- Door closing time: 3 s
- Passenger transfer time: 1.2 s
- Rated speed: 1.6 m/s.
- Rated acceleration: 1 m/s/s
- Rated jerk: 1 m/s/s/s

7. The value of lambda ($\lambda$) is:
   a) 0.18 passengers/second.
   b) 0.24 passengers/seconds.
   c) 0.30 passengers/second.
   d) None of the above.

8. What is the initial value of the number of passengers ($P_{ini}$)?
   a) 7.2
   b) 8.4.
   c) 9.6
   d) 12.1

9. What is the required number of elevators?
   a) 3.
   b) 4.
   c) 5.
   d) None of the above.

10. What is the final interval (i.e., at the handling capacity of 12%)?
   a) 24.3 s.
   b) 26.7 s.
   c) 28.9 s.
   d) 30 s (as the Handling Capacity is 12%).

Use the following formula if necessary: The time $t$ taken to complete a journey of distance $d$, with a rated speed of $v$, rated acceleration $a$, and rated jerk $j$ can be calculated as follows under the three different conditions:

If $d \geq \left( \frac{a^2 v + v^3 j}{aj} \right)$, then

$$t = \frac{d}{v} + \frac{v}{a} + \frac{a}{j}$$
If \( \frac{2a^3}{j^2} \leq d < \left( \frac{a^3 v + v^2 j}{aj} \right) \) then \( t = \frac{a}{j} + \sqrt{\frac{4d + \left( \frac{a}{j} \right)^2}{a}} \)

If \( d < \frac{2a^3}{j^2} \) then \( t = \left( \frac{32d}{j} \right)^{\frac{1}{3}} \)

Where
\( d \) is the distance to be traversed in m
\( a \) is the rated acceleration in m/s\(^2\)
\( j \) is the rated jerk in m/s\(^3\)
\( v \) is the rated speed in m/s
\( t \) is time taken to traverse this journey in s

The probable number of stops \( S \) and highest reversal floor (h) for equal floor heights can be calculated as follows:

\[
S = \sum_{i=1}^{N} \left( 1 - \left( \frac{i}{N} \right)^p \right) \quad \quad H = N - \sum_{i=1}^{N-1} \left( \frac{i}{N} \right)^p
\]

End of the Quiz