The University of Jordan, School of Engineering
First Semester 2017/2018, Selected Topics in Mechatronics 0908589
Mechatronics Engineering Department, Professor Lutfi Al-Sharif
Quiz 1, 8th October 2017, 09:30-09:50

Name: ___________________________
Registration Number: ___________________________

Place a cross in one square only.

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

1. What is the definition of the arrival rate (AR%) in a building?
   a) It is the number of passengers requiring elevator service in the busiest 5 minutes.
   b) It is the number of passengers requiring elevator service in the busiest 1 minute.
   c) It is the percentage of the building population requiring elevator service in the busiest 5 minutes.
   d) It is the percentage of the building population requiring elevator service in the busiest 1 minute.

2. An occupant floor in a building is:
   a) A floor on which most of the building population are present.
   b) A floor through which passengers can enter the building.
   c) A floor through which passengers can leave the building.
   d) A floor on which passengers will remain and that cannot be used to enter or leave the building.

3. An inter-entrance journey is a journey that:
   a) Originates on an entrance floor and terminates on an entrance floor.
   b) Originates on an entrance floor and terminates on an occupant floor.
   c) Originates on an occupant floor and terminates on an entrance floor.
   d) Originates on an occupant floor and terminates on an occupant floor.

4. A typical lunchtime traffic mix would be:
   a) 85% incoming traffic; 10% outgoing traffic; 5% inter-floor traffic.
   b) 100% incoming traffic.
   c) 90% outgoing traffic; 10% inter-floor traffic.
   d) 45% incoming traffic; 45% outgoing traffic; 10% inter-floor traffic.

5. An inter-floor journey is a journey that:
   a) Originates on an entrance floor and terminates on an entrance floor.
   b) Originates on an entrance floor and terminates on an occupant floor.
   c) Originizes on an occupant floor and terminates on an entrance floor.
   d) Originates on an occupant floor and terminates on an occupant floor.

6. The arrival rate in a building (AR%) is 15%. The building population is 1200 persons. Thus, the value of λ is:
   a) 60 passengers/second.
   b) 6 passengers/second.
   c) 0.6 passengers/second.
   d) The information is not sufficient to determine it.
7. The results of an arrival survey in a building are shown below. If you know that the building population is 1500 persons, what is the five minute arrival rate (AR%)?
   a) 13.0%.
   b) 14.4%.
   c) 14.8%.
   d) 22.2%.

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<td>07:59:00-07:59:59</td>
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8. Based on problem 7 above, what would the effective arrival rate (AR%) be if we based it on a one-minute arrival rate?
   a) 17.0%.
   b) 15.3%.
   c) 3.4%.
   d) It would still be the same result obtained in problem 7.

9. A building has 25 floors above the main entrance (numbered 1 to 25). All floors have equal height and each floor has a height of 3.5 m. Assume that the rated speed is 5 m/s, the rated acceleration is 1 m/s² and the rated jerk is 1 m/s³. What is the shortest journey in floors that is needed in order for the elevator to attain rated speed?
   a) 8 floors.
   b) 7 floors.
   c) The rated speed cannot be attained within the 25 floors of the building.
   d) None of the above.

10. For the same building described in problem 9, how long would it take to travel between the terminal floors (i.e., Ground to 25th floor) starting at zero speed and terminating at zero speed?
    a) 17.5 s.
    b) 24.2 s.
    c) 23.5 s.
    d) 22.8 s.

Use the following formula if necessary: If the following inequality is true: 
\[ d \geq \frac{a^2 \cdot v + v^2 \cdot j}{a \cdot j} \] 
Then the rated speed is attained, and the time required to cover this journey is: 
\[ t = \frac{d}{v + a} + \frac{a}{j} \]
Where 
- \( d \) is the distance to be traversed in m
- \( a \) is the rated acceleration in m/s²
- \( j \) is the rated jerk in m/s³
- \( v \) is the rated speed in m/s
- \( t \) is time taken to traverse this journey in s

End of the Quiz