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1. Read and **explain** the following context (15%)

   "Merging conflicts occur when vehicles enter a traffic stream; diverging conflicts occur when vehicles leave the traffic stream; weaving conflicts occur when vehicles cross paths by first merging and then diverging; and crossing conflicts occur when they cross paths directly.

   There are three basic ways of resolving crossing conflicts. *Time-sharing* solutions involve assignment of the right-of-way to particular movements for particular times. An example of this type of solution is the signalized intersection. *Space-sharing* solutions convert crossing conflicts into weaving conflicts. An example of this is the traffic circle. *Grade separation* solutions eliminate the crossing conflicts by placing the conflicting traffic streams at different elevations."

2. Read and **explain** the following context (15%)

   "One way of characterizing wheel loads is in terms of the total number of repetitions of an equivalent standard wheel load. Most commonly, this is an 80kN (18,000lb) wheel load, and the resulting traffic load is reported in terms of *equivalent single axle load* (ESAL). Traffic loads are expressed in terms of the total ESAL over the design life of the pavement. AASHTO provides a set of tables listing axle load equivalency factors for various axle types and weight classes. The axle load equivalency factors also depend on the structural number and terminal serviceability index of the pavement."

3. Read and **explain** the following context (15%)

   "Material specifications and the test procedures used to define these are an important element of asphalt mix design. Material specifications have been stated in terms of material properties-for instance, in terms of gradation, hardness, viscosity, etc. A recent trend has been to replace these material properties specifications with *performance specifications* that describe how the resulting pavement is supposed to perform over its lifetime."

4. Read and **explain** the following context (15%)

   "Structural design of track is primarily a matter of selecting the correct rail sections and tie spacings. Rail sections are designated by shape and by weight. The heavier the rail, the greater its resistance to bending. Tie spacings determine the number of ties the wheel load is spread over, and henmce the bearing pressure at the bottom of the tie. The closer the ties are to one another, the less the bearing pressure on any one tie, and hence the smaller the track deflection under a given load. Also, heavier ties result in stiffer track, which leads to smaller bending moments and grater stability."

5. Read and explain the following context with examples in Taiwan (20%)

   "The scope of ITS efforts includes

   ■ *Travel and transportation management*, to include en-route driver information, route guidance, traveler services information, traffic control, incident management, and emission testing mitigation.

   ■ *Travel demand management*, to include pretrip travel information, ride matching and reservation,

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and demand management and operations.

■ *Public transportation operations*, to include public transportation management, en-route transit information, personalized public transit, and public transit security.

■ *Electronic payment services.*

■ *Commercial vehicle operations*, to include automated roadside safety inspection, on-board safety monitoring, commercial administrative process.

■ *Advanced vehicle control and safety systems*, to include longitudinal collision avoidance, lateral collision avoidance, intersection collision avoidance, vision enhancement for crash avoidance, precrash restraint deployment, and automated highway systems."

6. Read the following context and answer the questions (20%)

　　Morning peak traffic upstream of a toll booth is given in the table below. The toll plaza consists of three booths, each of which can handle an average of one vehicle every 6 sec. The queuing diagram is shown below.

(a) Please calculate the service rate of the toll plaza. (How many vehicle per minute)

(b) When does the maximum queue happen? With what queue length? What is the longest delay?

(c) What is the total delay for this diagram?

Time period	10 min. volume	Cumulative volume
7:00-7:10	200	200
7:10-7:20	400	600
7:20-7:30	500	1100
7:30-7:40	250	1350
7:40-7:50	200	1550
7:50-8:00	150	1700