Q1// Answer the Following Multiple Choice Questions (MCQs):

1. The basic objective of traffic engineering is to achieve ___________
   - **Provide safe, convenient and economic movement of vehicles and pedestrians.**
   - Rapid flow of traffic.
   - Efficient, free and rapid flow of traffic with least priority given to accidents.

2. Which of the following roads are congested during peak hours?
   - Rural roads
   - **Urban roads**
   - Express ways

3. AADTs are used in several traffic and transportation analyses for
   - Measurement of current demand.
   - **Evaluation of the economic feasibility of highway projects.**
   - Development of parking regulations.

4. K factor represents proportion of AADT occurring during __________
   - 10th peak hour of the year.
   - 50th peak hour of the year.
   - **30th peak hour of the year.**

5. The number of trajectories crossing this line is the number of vehicles on the road at one instant in time which called __________
   - **Density**
   - Flow rate
   - Speed

Q2// A volume of 1200 vph is observed at an intersection approach. Find the peak flow rate within the hour for the following peak –hour factors:
1.00
0.90
0.80
0.70
Plot and comment on the results?

Solution:

$$Peak\ Flow\ Rate = \frac{Volume}{PHF}$$

For PHF =1.00

Peak Flow Rate $= \frac{1200}{1.00}$ =1200 veh/hr

For PHF =0.90

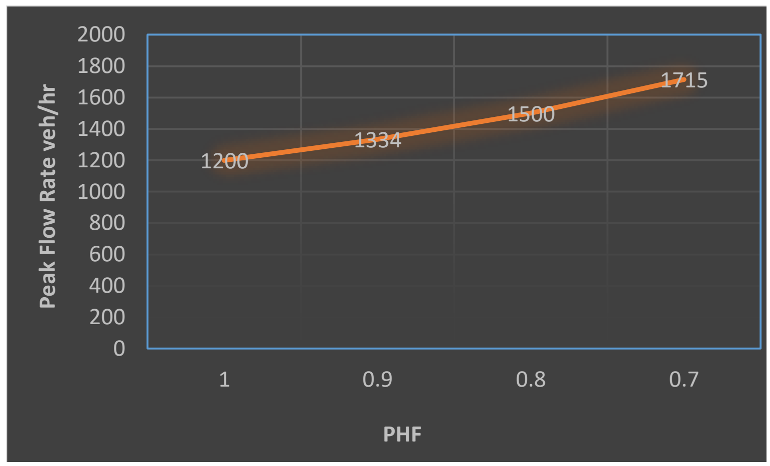
Peak Flow Rate $= \frac{1200}{0.90} =$ veh/hr

For PHF =0.80

Peak Flow Rate $= \frac{1200}{0.80}$ =1500 veh/hr

For PHF =0.70

Peak Flow Rate $= \frac{1200}{0.70}$ =1715 veh/hr



Low values of PHF illustrated that there is significant variation of traffic volume within the peak hour volume and higher values of PHF means the traffic volume is approximately equal within peak hour period.

Q3// A freeway detector records an occupancy of 0.26 for a 15-minute period. Of the detector is 3.4ft long, and the average vehicle has a length of 18ft, what is the density implied by this measurement.

Solution:

$$D = \frac{5280 \times O}{L_v + L_d} = \frac{5280 \times 0.26}{18 + 3.5} = 64\ veh/mile/ln$$

Q4// The following counts were taken on a major arterial during the evening peak period:

Time Periods	**Volume (vehs)**
4:00-4:15 PM	450
4:15-4:30 PM	465
4:30-4:45 PM	490
4:45-5:00 PM	500
5:00-5:15 PM	503
5:15-5:30 PM	506
5:30-5:45 PM	460
5:45-6:00 PM	445

From this data, determine:

- *The peak hour*
- *The peak hour volume*
- *The peak flow rate within the peak hour*
- *The peak hour factor (PHF)*

Solution:

The peak hour: 4:30-5:30

The peak hour volume: 1999 veh/hr

The peak flow rate within the peak hour $= \frac{506}{15\ min/60\ (minute\ per\ hr)} = 2024$ veh/hr

The peak hour factor $= \frac{1999}{506 \times 4} = 0.99$

Q5// Example: A temporary traffic count station measures traffic volume for seven days and daily factors as shown in Table (1). The ADT can be calculated as follows.

Day	Daily Volume (veh/day)	Daily Factors
Day 1	4,410	0.11
Day 2	5,135	0.12
Day 3	5,270	0.13
Day 4	5,114	0.15
Day 5	5,980	0.16
Day 6	4,295	0.16
Day 7	2,890	0.17

Solution:

Day	Daily Volume (veh/day)	Daily Factors	Weighted Volume
Day 1	4,410	0.11	4,410 x 0.11 = 490
Day 2	5,135	0.12	5,135 x 0.12 = 614
Day 3	5,270	0.13	5,270 x 0.13 = 676
Day 4	5,114	0.15	5,114 x 0.15 = 743
Day 5	5,980	0.16	5,980 x 0.16 = 971
Day 6	4,295	0.16	4,295 x 0.16 = 697
Day 7	2,890	0.17	2,890 x 0.17 = 494
		ADT (sum)=	4,686 (veh/day)

Q6// The projected AADT of a proposed facility is 33,000 veh/day. If the proportion of AADT in the design hour is 16 percent and the peak-hour directional distribution is 65:35, estimate the directional design hourly volume DDHV.

Solution:

DDHV = 33,000 × 0.16 × 0.65 = 3,430 vph.

Q7// Suppose the hourly volume in east- and west-bound directions of a highway are 1,300 and 2,200 vph during the peak hour, respectively. Note that the west-bound direction has the higher volume, therefore, it is the peak direction, and estimate the directional split factor D.

Solution:

The combined volume in both directions is:
1,300 + 2,200 = 3,500 vph

$D = \frac{2200}{3500} = 0.63 = 63\%$

Q8// If volume on Tuesday May 24, 2016 is 9,200 veh/day, and the monthly and day of week factors for May and Tuesday are 0.93 and 1.01, respectively, estimate AADT.

Solution:

AADT = 9,200 * 0.93 * 1.01 = 8,642 veh/day.