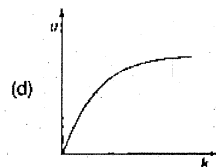
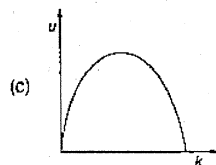
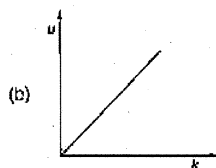
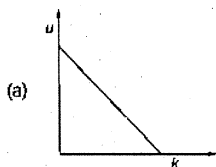


## Traffic Engineering

- Q.1 Which one of the following diagram illustrates the relation between speed ' $u$ ' and density ' $k$ ' of traffic flow?



- Q.2 Which one of the following method of  $O$  and  $D$  traffic survey is conducted for comparative analysis of traffic and transportation data?
- (a) Home interview  
(b) Roadside interview

- (c) Registration number method  
(d) Postcard method

- Q.3 The lost time due to starting delay on a traffic signal is noted to be 3 s, the actual green time is 25 s and yellow time is 3 s. How much is the effective green time?

- (a) 31 s (b) 28 s  
(c) 25 s (d) 22 s

- Q.4 Consider the following statements:  
Traffic volume data can be presented in the forms of:

1. Annual average daily traffic.
2. Trend charts.
3. Traffic maps along the routes.
4. Modal average.

Which of these statements are correct?

- (a) 1, 2 and 3 (b) 1, 2 and 4  
(c) 1 and 2 (d) 3 and 4

- Q.5 If  $L$  is the length of vehicle in meters,  $C$  is the clear distance between two consecutive vehicles (stopping sight distance),  $V$  is the speed of vehicles in km/hour, then the maximum number ( $N$ ) of vehicle/hour is equal to

- (a)  $N = \left( \frac{1000V}{C+L} \right)$  (b)  $N = \frac{C+L}{1000V}$   
(c)  $N = \frac{1000V}{C-L}$  (d)  $N = \frac{1000V}{L+V}$

- Q.6 Weaving length is the distance
- (a) equal to half the perimeter of central rotary  
(b) between the channelizing islands  
(c) equal to total width of adjoining radial roads  
(d) equal to diameter of central rotary

Q.7 Consider the following statements:  
Difference between airport and highway pavement thickness arises due to

1. Magnitude of wheel load
2. Tyre pressure
3. Number of repettions
4. Size of the vehicle

Which of the statements given above are correct?

- (a) 1, 2 and 4 (b) 1, 2 and 3  
(c) 1 and 4 (d) 2, 3 and 4

Q.8 The maximum number of passenger cars that can pass a given point on a lane or road-way during one hour under ideal road way and traffic condition is known as

- (a) Practical capacity  
(b) Possible capacity  
(c) Basic capacity  
(d) Road capacity

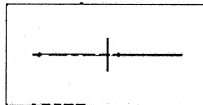
Q.9 In complex situations, total time required for a driver to make a judgement and to act, may be taken as

- (a) 1.0 sec (b) 1.5 sec  
(c) 3.0 sec (d) 2.5 sec

Q.10 Speed regulations on roads are decided on the basis of

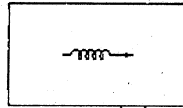
- (a) 60th percentile cumulative frequency  
(b) 75th percentile cumulative frequency  
(c) 80th percentile cumulative frequency  
(d) 85th percentile cumulative frequency

Q.11 On collision diagrams, the symbol shown in figure indicates



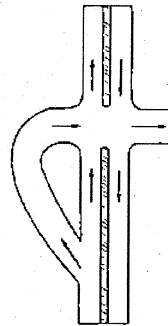
- (a) side swip  
(b) overturned vehicle  
(c) rear end collision  
(d) fatal accident

Q.12 On collision diagrams, the symbol shown in figure indicates



- (a) side-swip  
(b) overturned vehicle  
(c) rear end collision  
(d) fatal accident

Q.13 The type of intersection as shown in figure is known as



- (a) channelized intersection  
(b) channelized with median lanes intersection  
(c) channelized with island intersection  
(d) jug handle intersection

Q.14 The length of the side of warning sign boards of roads is

- (a) 30 cm (b) 40 cm  
(c) 45 cm (d) 50 cm

Q.15 The traffic manoeuvres imply

- (a) diverging (b) merging  
(c) crossing (d) all of these

Q.16 Rapid transit system refers to

- (a) a means of moving large volumes of people within an urban area  
(b) a means of moving large volumes of people between selected points by a channel separated from other parts of the system  
(c) an exclusive bus lane on urban arterials  
(d) a demand actuated rapid service

Q.17 Study the following statements:

1. Accident spot map is one which shows accidents by pins, posted spots or symbols on the map at the locations of accidents
2. Collision diagram is a sketch showing by means of arrows, the approximate path of vehicles and pedestrians involved in it
3. Condition diagram shows important physical to be studied, to aid in interpretation of accident patterns

The correct statements are

- (a) Both 1 and 2 (b) Both 1 and 3  
(c) Both 2 and 3 (d) 1, 2 and 3

Q.18 'Dead slow' is a

- (a) informatory sign (b) warning sign  
(c) regulatory sign (d) both (a) and (b)

Q.19 The maximum daily traffic capacity of bituminous pavements is

- (a) 2000 tons (b) 1500 tons  
(c) 1000 tons (d) 750 tons

Q.20 The background colour of the informatory sign board is

- (a) red (b) yellow  
(c) green (d) white

Q.21 As per IRC recommendations, the average level of illumination on important roads carrying fast traffic is

- (a) 10 lux (b) 15 lux  
(c) 20 lux (d) 30 lux

Q.22 Match List-I with List-II and select the correct answer by using the codes given below the lists:

- List-I  
A. Economic studies  
B. Financial studies  
C. Traffic studies  
D. Engineering studies

- List-II  
1. For road location and alignment  
2. For population and agricultural pattern  
3. For ascertaining the source of income  
4. For traffic volume and traffic flow patterns

Codes:

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 2 | 3 | 4 |
| (b) | 2 | 3 | 4 | 1 |
| (c) | 3 | 4 | 2 | 1 |
| (d) | 1 | 3 | 2 | 4 |

Q.23 Match List-I with List-II and select the correct answer by using the codes given below the lists:

- List-I

- List-II

- A. 1. Crossing left

- B. 2. Merging left

- C. 3. Weaving left

- D. 4. Diverging left

Codes:

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 4 | 3 | 2 |
| (b) | 2 | 4 | 1 | 3 |
| (c) | 2 | 3 | 1 | 4 |
| (d) | 3 | 4 | 1 | 2 |

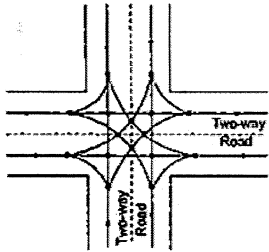
Q.24 Which of the following data would be required for the design of progressive type computerised traffic signal system in a series of intersections on a busy route?

- (i) Volume of fast moving traffic  
(ii) Volume of pedestrian traffic  
(iii) Volume of slow moving traffic  
(iv) Width of roads  
(v) approach speed of fast moving traffic

The correct answer is

- (a) (i), (ii), (iv) and (v)  
(b) (i), (ii), (iii) and (iv)  
(c) (ii), (iii) and (v)  
(d) (i), (iii), (iv) and (v)

- Q.25 Refer to the figure and match List-I with List-II. Choose the correct answer by using codes given below the lists:



- | List-I                           |  | List-II |
|----------------------------------|--|---------|
| A. Merging conflicts             |  | 1. 4    |
| B. Right angle crossing conflict |  | 2. 4    |
| C. Acute angle crossing conflict |  | 3. 4    |
| D. Diverging conflicts           |  | 4. 12   |

Codes:

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 2 | 3 | 4 |
| (b) | 4 | 1 | 2 | 3 |
| (c) | 4 | 1 | 3 | 2 |
| (d) | 1 | 4 | 2 | 3 |

- Q.26 Match List-I with List-II and select the correct answer by using the codes given below the lists:

List-I

- Traffic volume
- Traffic density
- Traffic capacity
- Basic capacity

List-II

- Vehicles per kilometre
- Maximum number of vehicles per lane that can pass a point in unit time
- Vehicles per hour
- Maximum number of passenger cars that pass a point per hour under most nearly ideal roadway & traffic condition.

Codes:

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 2 | 3 | 4 |
| (b) | 3 | 2 | 1 | 4 |
| (c) | 4 | 1 | 3 | 2 |
| (d) | 3 | 1 | 2 | 4 |

- Q.27 Match List-I (Type of intersection) with List-II (Name of intersection) and select the correct answer by using the codes given below the lists:

List-I

- 
- 
- 
- 

- List-II
- Wye
  - Cross
  - Tee
  - Skewed and staggered

Codes:

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 3 | 1 | 2 | 4 |
| (b) | 1 | 2 | 3 | 4 |
| (c) | 3 | 4 | 2 | 1 |
| (d) | 1 | 4 | 3 | 2 |

- Q.28 Match List-I (Grade separated intersection) with List-II (Interchange ramp) and select the correct answer by using the codes given below the lists:

List-I

- 
- 
- 
- 

List-II

- Diverging right and merging right
- Diverging right and merging left
- Diverging left and merging right
- Diverging left and merging left

Codes:

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 3 | 2 | 4 |
| (b) | 3 | 2 | 1 | 4 |
| (c) | 4 | 1 | 2 | 3 |
| (d) | 3 | 4 | 1 | 2 |

- Q.29 Match List-I with List-II and select the correct answer by using the codes given below the lists:

List-I

- 
- 
- 
- 

List-II

- Partial clover leaf interchange
- Full clover leaf interchange
- Diamond interchange
- Tee-interchange

Codes:

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 3 | 1 | 2 | 4 |
| (b) | 3 | 4 | 2 | 1 |
| (c) | 1 | 3 | 4 | 2 |
| (d) | 4 | 3 | 2 | 1 |

- Q.30 In speed and delay study, if the average journey time on a stretch of road length of 3.5 km is 7.55 minutes and the average stopped delay is 1.8 minutes, the average running speed will be, nearly

- 36.5 kmph
- 37.5 kmph
- 38.5 kmph
- 39.5 kmph

- Q.31 Traffic flow equation for a section of road is  $u = 80 - 0.7 K$  where 'u' is the speed in kmph and K is the density in vpk. The maximum expected flow is

- 4572 vph
- 2286 vph
- 1143 vph
- 572 vph

- Q.32 During measurement in spot speed study, a total of 1000 vehicles were observed, 85 percentile and 15 percentile speeds were obtained as 40 kmph and 10 kmph respectively. The number of vehicles moving between speeds of 10 kmph and 40 kmph would be

- 350
- 500
- 600
- 700

- Q.33 It was noted that on a section of road, the free speed was 80 kmph and the jam density was 70 vpk. The maximum flow in vph that could be expected on this road is

- 800
- 1400
- 2800
- 5600

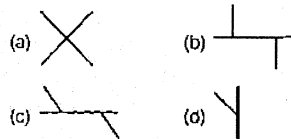
Q.34 Select the correct statement.

- (a) Traffic volume should always be more than traffic capacity
- (b) Traffic capacity should always be more than traffic volume
- (c) Spot speed is the average speed of a vehicle at a specified section
- (d) 85<sup>th</sup> percentile speed is more than 98<sup>th</sup> percentile speed

Q.35 Which of the following is indicated by a warning sign?

- (a) Level crossing
- (b) No parking
- (c) End of speed limit
- (d) Overtaking prohibited

Q.36 Which of the following shows skewed and staggered form of intersection?



Q.37 Maximum number of vehicles can be parked with

- (a) parallel parking
- (b) 30° angle parking
- (c) 45° angle parking
- (d) 90° angle parking

Q.38 Desire lines are drawn based on

- (a) spot speed studies
- (b) traffic volume studies
- (c) accident studies
- (d) origin and destination studies

Q.39 When two roads with two-lane, two-way traffic, cross at an uncontrolled intersection, the total number of potential major conflict points would be

- (a) 32
- (b) 24
- (c) 16
- (d) 4

Q.40 The traffic conflicts that may occur in a rotary intersection are

- (a) merging and diverging
- (b) crossing and merging
- (c) crossing and diverging
- (d) crossing, merging and diverging

Q.41 A roadway had a capacity of 1000 vehicles/hour when there were only passenger cars playing on it. The same road way under similar conditions had a capacity of 500 vehicles/hr when vehicles of only a particular class plied on it. The PCU (Passenger Car Unit) of that particular vehicle is

- (a) 0.25
- (b) 0.5
- (c) 4
- (d) 2

Q.42 The speed and delay studies on a defined section of highway are conducted by

- (a) radar gun
- (b) traffic counters
- (c) moving car method
- (d) enoscope

Q.43 Traffic volume is equal to

- (a) Traffic density  $\times$  traffic speed
- (b)  $\frac{\text{traffic density}}{\text{traffic speed}}$
- (c)  $\frac{\text{traffic speed}}{\text{traffic density}}$
- (d) None of the above

Q.44 Match List-I with List-II and select the correct answer by using the codes given below the lists:

List-I

- A. Transfer of vehicle towards adjacent traffic lane
- B. Crossing the path of adjacent lane with small angle in the same direction
- C. Time interval between the passage of successive vehicles moving in the same lane and measured from the head to head at a point
- D. Most hazardous traffic manoeuvring

List-II

- 1. Time head
- 2. Weaving
- 3. Lane change
- 4. Crossing at level

Codes:

- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 2 | 3 | 4 |
| (b) | 3 | 2 | 1 | 4 |
| (c) | 3 | 4 | 1 | 2 |
| (d) | 2 | 1 | 4 | 3 |

Q.45 The free mean speed on a road wing is found to be 60 kmph under stopped condition the average spacing between vehicles is 6 m. The capacity of flow, assuming linear speed density relations

- (a) 2333 veh/hr
- (b) 3333 veh/hr
- (c) 2870 veh/hr
- (d) 3838 veh/hr

Q.46 At an intersection if the normal flows on two approach roads are respectively 500 pcu per hr and 300 pcu per hr, the saturation flows are 1600 pcu per hr on each road and the total lost time per signal cycle is 16 s, then the optimum cycle time by Webster's method is;

- (a) 48 sec
- (b) 72 sec
- (c) 39 sec
- (d) 58 sec

Q.47 The number of conflict points which can arise with one-way regulator in both direction on an intersection having four legs is

- (a) 4
- (b) 6
- (c) 8
- (d) 10

### Answers Traffic Engineering

- |         |         |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a)  | 2. (b)  | 3. (d)  | 4. (a)  | 5. (a)  | 6. (b)  | 7. (b)  | 8. (c)  | 9. (c)  | 10. (d) |
| 11. (c) | 12. (b) | 13. (d) | 14. (a) | 15. (d) | 16. (d) | 17. (d) | 18. (c) | 19. (b) | 20. (b) |
| 21. (b) | 22. (b) | 23. (b) | 24. (a) | 25. (a) | 26. (d) | 27. (a) | 28. (a) | 29. (a) | 30. (a) |
| 31. (b) | 32. (d) | 33. (b) | 34. (b) | 35. (a) | 36. (c) | 37. (d) | 38. (d) | 39. (b) | 40. (a) |
| 41. (d) | 42. (c) | 43. (a) | 44. (b) | 45. (b) | 46. (d) | 47. (b) |         |         |         |

### Explanations Traffic Engineering

10. (d)  
Upper speed limit for regulation = 85<sup>th</sup> percentile speed  
Lower speed limit for regulation = 15<sup>th</sup> percentile speed  
Speed to check design elements = 98<sup>th</sup> percentile speed
26. (d)  
Possible Capacity: Is the maximum number of vehicles that can pass a given point on a lane or roadway during one hour under prevailing roadway and traffic conditions. The possible capacity of a roadway is generally much lower than the basic capacity as the prevailing roadway

and traffic conditions are seldom ideal. In a worst case when the prevailing condition is so bad that due to traffic congestion, the traffic may come to end, the possible capacity of the road may approach zero.

When the prevailing roadway and traffic conditions approach the ideal conditions, the possible capacity would also approach the basic capacity. Thus the value of possible capacities varies from zero to basic capacity.

Practical Capacity: Is the maximum number of vehicle that can pass a given point on a lane or road way during one hour, without traffic density being so great as to cause unreasonable delay, hazard or restriction to the driver's freedom

to manoeuvre under the prevailing roadway and traffic conditions. It is the practical capacity which is of primary interest to the designers who strive to provide adequate highway facilities and hence this is also called design capacity

30. (a)  
Average journey time = 7.55 minutes  
Average stopped delay = 1.8 minutes  
 $\therefore$  Av. running time = 7.55 - 1.8 = 5.75 minutes

$$\text{Av. running speed} = \frac{3.5 \times 60}{5.75} = 36.5 \text{ kmph}$$

31. (b)  
 $u = 80 - 0.7k$   
Flow  $q = ku = (80 - 0.7k)k$   
 $= 80k - 0.7k^2$   
For maximum flow,

$$\frac{dq}{dk} = 80 - 1.4k = 0$$

$$\Rightarrow k = \frac{80}{1.4}$$

$\therefore$  The maximum expected flow

$$= 80 \times \frac{80}{1.4} - 0.7 \times \left(\frac{80}{1.4}\right)^2$$

$$= 2286 \text{ vph}$$

32. (d)  
Total no. of vehicles = 1000  
No. of vehicles corresponding to 85 percentile speed = 850  
No. of vehicles corresponding to 15 percentile speed = 150  
 $\therefore$  No. of vehicles moving between speeds of 10 kmph and 40 kmph  
 $= 850 - 150 = 700$

33. (b)  
 $q_{max} = \frac{V_s K_f}{4} = \frac{80 \times 70}{4} = 1400$

34. (b)  
Traffic capacity is the ability of a road to accommodate traffic volume. It is expressed as

the maximum number of vehicles in a lane or a road that can pass a given point in a unit time, usually an hour.

37. (d)  
Angle parking or parallel parking may be allowed in the kerb parking. Angle parking may be at angle 30, 60 or 90 degrees. Angle parking accommodates more vehicles per unit length of kerb and maximum vehicles that can be parked is with an angle of 90 degree.

38. (d)  
Desire lines are plotted which is a graphical representation prepared in almost all O and D surveys. Desire lines are straight lines connecting the origin points with destinations. The width of such desire lines is drawn proportional to the number of trips in both directions.

39. (b)  
Point of potential conflicts depend on the number of lanes on intersecting lanes.  
For two way traffic on a right angled road intersection, the conflict points are 24 whereas for two way traffic on T-intersection the conflict point are 18 only.

41. (d)  
The PCU may be considered as a measure of the relative space requirement of a vehicle class compared to that of a passenger car under a specified set of roadway, traffic and other conditions.

$$\text{PCU value} = \frac{\text{Capacity of roadway with passenger car only}}{\text{Capacity of roadway with a particular class vehicle only}}$$

$$= \frac{1000}{500} = 2$$

42. (c)  
Traffic counters are used for traffic volume study and enoscope is used for spot speed study. Floating car method or riding check method or moving car method is used for speed and delay studies.

45. (b)

$$\text{Jam density} = \frac{1000}{6} = 166.67 \text{ veh/km}$$

Maximum flow or capacity

$$= \left(\frac{80}{2}\right) \left(\frac{166.67}{2}\right)$$

$$= 3333.33 \text{ veh/hr}$$

46. (d)  
Using Webster's method  
Optimum cycle time,

$$C_0 = \frac{1.5L + 5}{1 - y}$$

$$L = \text{Total lost time per cycle} = 16 \text{ sec}$$

$$Y = Y_1 + Y_2$$

$$Y_1 = \frac{500}{1600} \text{ and } Y_2 = \frac{300}{1600}$$

$$\therefore Y = \frac{(500 + 300)}{1600} = 0.50$$

$$C_0 = \frac{1.5 \times 16 + 5}{1 - 0.5} = 58 \text{ sec}$$

47. (b)  
6 conflict points can arise with one-way regulation in both direction on an intersection having four legs.

■■■■