Traffic Engineering Test 2

Number of Questions: 25 **Time: 60 min.**

Directions for questions 1 to 25: Select the correct alternative from the given choices.

1. The vehicle speed affects the design of
(A) sight distance
(B) super elevation
(C) length of transition curve
(D) All of the above

2. The wheel base of the vehicle is 8.5 m. The off-tracking while negotiating curved path with mean radius of 32 m is
(A) 1.18 m (B) 1.13 m
(C) 1.12 m (D) 1.15 m

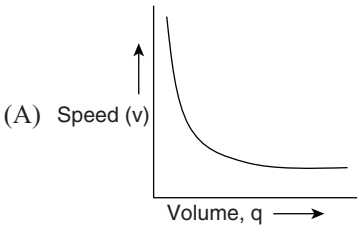
3. The speed at which (or) below which 85 percent of vehicles are passing the point on highway can be assessed is known as
(A) 85^{th} percentile speed
(B) 20^{th} percentile speed
(C) 15^{th} percentile speed
(D) 25^{th} percentile speed

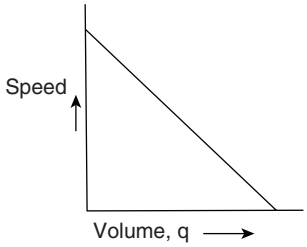
4. The method of origin and destination studies in which the car is struck with a pre-coded card as it enters the area under study is
(A) Road side interview method
(B) Home interview method
(C) License plate method
(D) Tag on car method

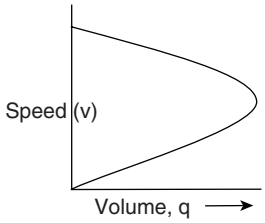
5. A vehicle *a* of weight 2 tonne skids through a distance equal to 50 m before colliding with other parked vehicle of weight 1 tonne. After collision both the vehicles together skid through a distance of 10 m before stopping. The initial speed of moving vehicle is (Assume coefficient of friction $f = 0.5$).
(A) 9.89 m/s (B) 8.93 m/s
(C) 7.96 m/s (D) 9.82 m/s

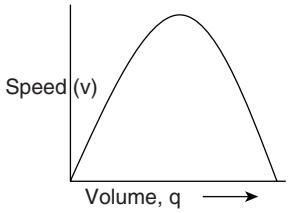
6. When a vehicle moves obliquely across the path of another vehicle moving in same direction at small angle of crossing is termed as
(A) Merging (B) Weaving manoeuvre
(C) Crossing manoeuvre (D) Diverging

7. Which of the following graph represents relation between speed and volume?

(A) 

(B) 

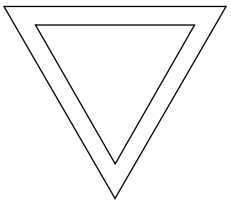
(C) 

(D) 

8. The free mean speed on a roadway is found to be 100 kmph under stopped condition the average spacing between vehicles is 8.9m. The Jam density of flow is
(A) 113 vehicles/km
(B) 118 vehicles/km
(C) 145 vehicles/km
(D) 148 vehicles/km

9. The maximum number of vehicles that can pass a given point on a lane or roadway during one hour under prevailing traffic conditions is known as
(A) Basic capacity
(B) Practical capacity
(C) Possible capacity
(D) Highway capacity

10.



The above sign is categorized under
(A) Warning signs
(B) Regulatory signs
(C) Informatory signs
(D) None of these

11. The theoretical capacity of traffic lane with one way traffic flow at a stream speed of 80 kmph. The average

space gap $S_g = 0.278\ Vt$ and average length of vehicles = 8m

(A) 3450 veh/hr/lane (B) 3395 veh/hr/lane
(C) 3530 veh/hr/lane (D) 3834 veh/hr/lane

12. The average normal flow of traffic on cross roads *A* and *B* during design period are 400 and 250 PCU per hour, the saturation flow values on these roads is estimated to be 1350 and 1200 PCU per hour respectively. The all-red time required for pedestrian crossing is 15 sec. The total cycle time using Webster's method is

(A) 62.4 sec (B) 63.3 sec
(C) 65.53 sec (D) 67.5 sec

13. (i) At intersection the area of conflict should be as small as possible
(ii) Sudden change of path should be avoided

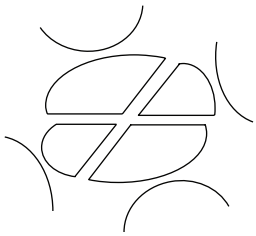
(A) (i) and (ii) are true (B) (ii) and (iii) are false
(C) (i) is true (ii) is false (D) (i) is false (ii) is true

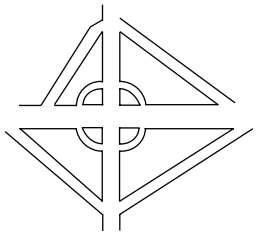
14. In a street light system
Street width = 20m
Mounting height = 10m
Lamp size = 5000 lumen
Luminaire type – II
Coefficient of utilization = 0.36
Spacing between lighting units if average lighting intensity is 6 Lux
(assume maintenance factor = 0.8)

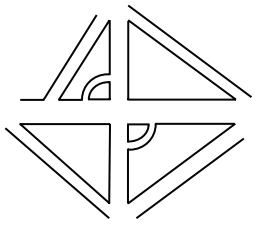
(A) 16 m (B) 18 m
(C) 15 m (D) 12 m

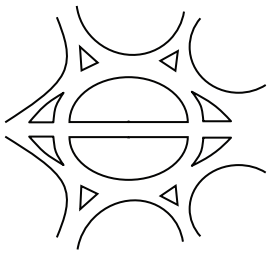
15. Match the following

1. Diamond a.
2. Rotary b.
3. Partial clover leaf c.
4. Full clover leaf d.









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

16. The no parking symbol is represented by

(A) triangle (B) circle
(C) octagonal (D) hexagonal

17. The practical capacity of a rotary is given by the formula

(A) $Q_P = \dfrac{280W(1+W)\left(1-\dfrac{p}{3}\right)}{\left(1+\dfrac{W}{L}\right)}$

(B) $Q_P = \dfrac{280w\left(1+\dfrac{w}{L}\right)\left(1-\dfrac{P}{3}\right)}{\left(1+\dfrac{e}{w}\right)}$

(C) $Q_P = \dfrac{280w\left(1+\dfrac{e}{w}\right)\left(1+\dfrac{w}{L}\right)}{\left(1-\dfrac{P}{3}\right)}$

(D) None of the above

18. The average width of entry e_1 is 150 m and average width of exit is 200 m. The width of the rotary roadway is

(A) 182 m (B) 178 m
(C) 176 m (D) 179 m

19. Match the following

	Type of Marking		Areas
1.	Markings at intersections	a.	slow & stop
2.	Carriage way marking	b.	speed change lanes and stop lines
3.	object markings	c.	no parking zones and traffic lanes
4.	word messages	d.	kerb markings and objects within the carriage way

Codes:

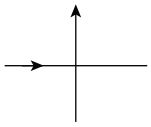
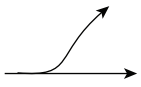
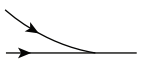
	1	2	3	4
(A)	c	a	b	d
(B)	d	c	b	a
(C)	b	c	d	a
(D)	a	d	c	b

20. Desired lines are used in
(A) speed and delay studies
(B) origin and destination study
(C) spot speed study
(D) None of these

21. The spacing between the vehicles allowed by the driver of the following vehicle does not depends on
(A) speed of leading vehicle
(B) Average length and width of vehicle class
(C) tyre and characteristics of two vehicles
(D) driver characteristics of following vehicle

22. The speed of road is 100 kmph and average center to center spacing of vehicles (or) space headway is 10m. The capacity of single lane is
(A) 10^3 veh/hr/lane (B) 10^5 veh/hr/lane
(C) 10^4 veh/hr/lane (D) 10^2 veh/hr/lane

23. Match the following

Traffic Man oeuvres		Figures	
1.	diverging left	a.	
2.	diverging right	b.	
3.	Crossing right	c.	
4.	merging left	d.	

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

24. The charts showing the volume variations over a period of years are known as
(A) Trend charts
(B) Variation charts
(C) Traffic flow maps
(D) Volume flow diagram

25. A vehicle moving at 40 kmph speed was stopped by applying brakes and length of skid mark is 13.2 m. Average skid resistance of pavement is 0.5. The brake efficiency of test vehicle is
(A) 64.6% (B) 73.7%
(C) 86.9% (D) 95.4%

Answer Keys

1. D	**2.** C	**3.** A	**4.** D	**5.** A	**6.** B	**7.** C	**8.** A	**9.** C	**10.** B
11. B	**12.** D	**13.** A	**14.** D	**15.** B	**16.** B	**17.** A	**18.** D	**19.** C	**20.** B
21. B	**22.** C	**23.** B	**24.** A	**25.** D					

Hints and Explanations

1. Choice (D)

2. Off tracking $= \frac{L^2}{2R} = \frac{8.5^2}{2\times 32} = 1.12\text{m}$ Choice (C)

3. Choice (A)

4. Choice (D)

5. Loss of kinetic energy of both vehicles together = work done against frictional force

$$\left(\frac{w_a + w_b}{2g}\right)\left(V_2^2 - V_1^2\right) = (w_a + w_b) f S_2$$

$$= \frac{V_2^2 - V_1^2}{2g} = fS_2$$

But $V_4 = 0$

$$\frac{V_3^2}{2g} = 0.5 \times 10$$

$$V_3 = \sqrt{0.5\times 10\times 2\times 9.8} = 9.89 \text{ m/s}$$ Choice (A)

6. Choice (B)

7. Choice (C)

8. Spacing between vehicles $s = 8.9$ m

$$\text{Jam density} = \frac{1000}{s} = \frac{1000}{8.9} = 112.3$$

$KM_{ax} \simeq 113$ vehicles/km (per lane) Choice (A)

9. Choice (C)

10. It is a give way sign categorized as Regulatory sign Choice (B)

11. Reaction time of ideal driver $t = 0.7$ sec

$S = 0.278\ Vt + L$

$= (0.278 \times 80 \times 0.7) + 8$

$= 23.568\text{m}$

$\therefore$ Theoretical capacity $= \frac{1000\text{V}}{S} = \frac{1000\times 80}{23.568}$

$= 3394.4$

$\cong 3395$ veh/hr/lane

Choice (B)

12. $y_a = \frac{q_a}{S_a} = \frac{400}{1350} = 0.296$

$y_b = \frac{q_b}{S_b} = \frac{250}{1200} = 0.208$

$Y = y_a + y_b = 0.296 + 0.208 = 0.504$

Lost time $= 2n + R = (2 \times 2) + 15 = 19$ sec

Optimum cycle time $C_o = \frac{1.5L + 5}{1 - Y}$

$= \frac{(1.5 \times 19) + 5}{1 - 0.504} = 67.54$ sec

$G_a = \frac{y_a}{Y}(C_o - L)$

$= \frac{0.296}{0.504}(67.54 - 19) = 28.5$ sec

$G_b = \frac{y_b}{Y}(C_o - L) = \frac{0.208}{0.504}(67.54 - 19) = 20$ sec

Total cycle time $= 28.5 + 20 + (15 + 2 + 2)$

$= 67.5$ sec Choice (D)

13. Choice (A)

14. Spacing

$$= \frac{\text{lamp lumem} \times \text{coefficient of utilization} \times \text{Maintenance factor}}{\text{Average lux} \times \text{width of road}}$$

$= \frac{5000 \times 0.36 \times 0.8}{6 \times 20} = 12$m Choice (D)

15. Choice (B)

16. Choice (B)

17. Choice (A)

18. Average width of rotary is

$= \left[\frac{e_1 + e_2}{2}\right] + 3.5$

$= \frac{150 + 200}{2} + 3.5 = 178.5\text{m} \cong 179$ m. Choice (D)

19. Choice (C)

20. Choice (B)

21. Choice (B)

22. Capacity of single lane is $= \frac{1000\text{V}}{S}$

$= \frac{1000 \times 100}{10}$ (V in 'kmph' S in 'm')

$= 10^4$veh/hr/lane Choice (C)

23. Choice (B)

24. Choice (A)

25. Brake efficiency $= \frac{100 f^1}{f}$

Average skid resistance developed, $f^1 = \frac{v^2}{2gL}$

$V = \frac{v}{3.6} = \frac{40}{3.6} = 11.11$ m/s

$f^1 = \frac{11.11^2}{2 \times 9.81 \times 13.2} = 0.477.$

Brake efficiency $= \frac{100 \times 0.47}{0.5} = 95.4\%$ Choice (D)