Name: ____________________________________

1. Urban Roads (4)
   a. Mark the following statements as true or false (2):

<table>
<thead>
<tr>
<th></th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Road Lane Width standards are made depending on what function a road serves</td>
<td></td>
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<tr>
<td>ii. Less road width becomes important if you want drivers to drive slower</td>
<td></td>
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<tr>
<td>iii. Lane width can be 3m or less for speed limits of 40 km/h or less</td>
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<td></td>
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<tr>
<td>iv. Lane width for speed limits of 120 km/h or more should be greater than 3.5 m</td>
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</tbody>
</table>

b. What is the most important Principle for ensuring urban safety? Select the correct answer.
   i. Urban residents must be given intensive training for observing safety on the road
   ii. Roads must be designed to adapt to the limitations of road users.
   iii. Vehicles should have automated systems.
   iv. None of the above

b. Urban roads must be designed to ensure safety to the most vulnerable group of road users. Highest proportion of road crash victims in urban areas are (mark the correct statement):  
   i. Car occupants
   ii. Bus occupants
   iii. Three-wheeler occupants
   iv. Pedestrians and motorised two-wheelers
2. **Speed (1)**
   a. Mark the Safe speed limit on urban arterial:
      i. 20 km/h  
      ii. 50 km/h  
      iii. 60 km/h  
      iv. 80 km/h  
   
   b. Near Schools the safe speed limit should be reduced to 20 km/h because: (mark the correct answer)
      i. presence of too many cars  
      ii. presence of young children who can run across the road suddenly  
      iii. presence of school buses  
      iv. none of the above

3. **Cross section of urban roads (1)**
   a. Mark the correct statement
      i. Local roads should be designed for 50 km/h speed  
      ii. Local roads may not have a separate bicycle track.  
      iii. Local roads should have a separate bus lane.  
   
   b. Minimum width of pedestrian path should be 1.8 m because
      i. pedestrians safety is improved  
      ii. this meets the Universal accessibility requirement (wheel chair movement)  
      iii. It can be used by bicyclists too

4. **Safe Intersections in urban areas (1.5)**
   a. Most effective method (in line with vision zero) of improving safety at unsignalized intersections in urban setting is:
      i. Cutting all trees around the junction  
      ii. Increasing lighting level  
      iii. Constructing speed humps/rumble strips on all four approaches
   
   b. List three reasons why a well-designed roundabout is safer than a signalised crossing:
      i. Number of conflict points are reduced,  
      ii. Speeds are reduced  
      iii. Angle of impact is usually less than 90 degrees  
      iv. All of the above
   
   c. What should be done to reduce pedestrian crashes on a signalised junction where a large number of vehicles are observed to jump red light?
      i. Double the lumen level at the junction  
      ii. Install rumble strips before the painted zebra crossing  
      iii. Design pedestrian refuge
5. Traffic calming principles (3)
   a. You have to install a flat top hump near school (20km/h zone) to ensure children’s safety. What length and gradient will you suggest (ref. figure below)?

   **Ramp Length:**

   **Gradient:**

   ![Geometric Details of Road Hump](image)

   ![Cross Section X X](image)

<table>
<thead>
<tr>
<th>Geared Speed (km/h)</th>
<th>Length of Ramp (m)</th>
<th>Standard of Rise (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 km/h (0.7m)</td>
<td>1.5</td>
<td>4.5</td>
</tr>
<tr>
<td>25 km/h (0.8m)</td>
<td>1.9</td>
<td>3.5</td>
</tr>
<tr>
<td>30 km/h (1.0m)</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>35 km/h (1.0m)</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>40 km/h (1.5m)</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>50 km/h (2.0m)</td>
<td>2.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

   b. IRC SP 99 (Traffic Calming) recommends repeated bar markings on two lane road before approaching a habitation, why: Mark the most appropriate answer:
   i. Reduce speeds from 80km/h to 40km/h
   ii. Caution drivers of cross traffic
   iii. Warn drivers of approaching habitation(40/km h zone), and gradually reduce speed

   c. Before and after: List three features in Figure 2 which have been introduced to improve traffic safety as compared to Figure 1
   i. 
   ii. 
   iii. 


Figure 1

Figure 2
6. **Expressway (1)**
   a. Mark the most appropriate statement for designing safe expressway
      i. Design must provide for driver error and emergency manoeuvres
      ii. Design should be safe for well trained drivers
      iii. Design should prevent overtaking manoeuvres
   b. “Clear zone” width requirement in expressway is higher than non access control highways because:
      i. Heavy vehicles use expressways
      ii. Pedestrian and non motorised traffic is not expected there
      iii. Design speeds are higher than non access control roads

7. **Cross sections (1.5)**
   a. Mark the correct answer:
      i. Lane width on expressways and urban arterial roads should be the same.
      ii. Lane width on expressways should be higher than the urban arterial lanes
      iii. Lane width on expressways should be less than the urban arterial lane
   b. Most important reason for not permitting raised median on expressways:
      i. It prevents U turns
      ii. It can result in single vehicle over turning and roll over
      iii. It discourages animal crossing
   c. Mark the best option for expressway median:
      i. 200 mm raised and 6 m wide
      ii. Flush with carriageway, 6 m wide with a double sided crash barrier
      iii. Depressed median, 20 m wide with shrubs in the middle

8. **Flooding (3)**
   a. Which are the four major factors influencing the flooding of an area?
   b. Given the inflow and outflow hydrographs for the reach routing and reservoir routing case, how would you differentiate between the two?
   c. What would be the two major implications if it is projected that the precipitation shall increase in future due to climate change?
9. Safe barriers (2)

a. Difference between W beam and Thrie beam barriers (mark the most appropriate answer):
   i. Height of Thrie beam above ground is more than the W beam barrier
   ii. Thrie beam is installed in a concrete base and W Beam is hammered into the compacted earth
   iii. W beam has retro reflective paint, and Thrie beam does not have retro reflective paint

b. Ideal location for installing wire rope barrier is:
   i. Valley side of a hill road
   ii. Rolling terrain with at least 2 m flat surface beyond the shoulder
   iii. In place of a bridge parapet wall

c. Why is W beam not safe for heavy vehicles (HV)?
   i. Strength of the material used for W beam cannot withstand the impact from heavy vehicles
   ii. Centre of Gravity of HV is higher as compared to cars, W beam height of 730 mm is not able to prevent roll over
   iii. W beam does not have concrete base

d. Wire rope barrier is preferred over W beam barrier because:
   i. Re-installation is easier
   ii. Initial cost is more than a W beam barrier
   iii. It is better for 2 wheelers
10. Crash Cushion (2)
   a. Length and design of crash cushion is important to ensure safety of errant vehicles.

   i. Recommend appropriate length for crash cushion for an expressway (120km/h):
   ii. Recommend appropriate length of a four lane road (80km/h):

11. Problem identification and remedial measures (2)
   a. Expressway crash data shows 25% of roll over crashes involving buses and trucks after hitting the W beam crash barrier. What would you recommend to address this problem:
      i. Replace W beam crash barrier with wire rope barrier
      ii. Replace W beam barrier with New Jersey barrier
      iii. Replace W beam barrier with modified Thrie beam barrier
   b. List two important features in figure which would increase probability of a road crash, and suggest corrective measures
12. Roadside hazard management (2)
   a. What is Effective Clear Zone length for straight section of highway with operating speed of 75 km/h and AADT of 5000 vehicles per day (Proportion of trucks is 36%)?

   i. 4m
   ii. 6m
   iii. 8m
   iv. 9m
b. Clear-zone distance mainly depends on the following
   i. Horizontal alignment
   ii. Speed
   iii. Side slopes
   iv. All the above

c. What hazard(s) do you find on this Indian road?
   i. Barrier too far away from the pavement edge
   ii. Incorrect joint overlap
   iii. Recovery area is insufficient
   iv. W-section is not suitable under Indian conditions

d. What hazard(s) do you find on this hill road?
   i. Clear zone is not available
   ii. Recovery area is insufficient
   iii. Improper delineation
   iv. All of the above
13. **Highway Acts (2)**
   a. Which act provides basis for establishment of Highway Administration?
      i. National Highways Act, 1956
      ii. National Highways Authority of India Act, 1988
      iii. National Highways (Land and Traffic) Act, 2002
      iv. Parliamentary Committee on Public Undertakings (2017-18)
   b. Cess @ ₹ 1/ltr on fuel goes into ________
      i. National Highways Development fund
      ii. Central Road Safety Fund
      iii. Central Road Fund
      iv. None of the above

14. **Safety Audit Approach (2)**
   a. Define the following:
      i. Nominal Safety
      ii. Substantive Safety

15. **Landslides (2)**
   a. How is the clay content checked on the site?
      i. Smell
      ii. Soft feel
      iii. Plastic behaviour
      iv. All the above
   b. Which of the following is the true difference between drained and undrained behaviour in soils?
      i. Soil type
      ii. Permeability
      iii. Time
      iv. All of the above
   c. Which of these is not a good option for retaining rock falls?
      i. Concrete retaining walls
      ii. Nets
      iii. Anchors
      iv. All of the above
   d. Pick the odd one out in terms of landslide trigger?
      i. Rainfall
      ii. Groundwater decrease
      iii. Snow
      iv. Earthquake