1. **Haddon’s Safety Matrix (6)**

In a recent crash a vehicle (Mercedes SUV) going at 120km/h on a national highway (six lane divided road) collided with the concrete parapet of a bridge on the left side. The bridge had 2 lanes in each direction. Driver and the front seat passenger who were wearing seatbelts had serious injuries. Rear seat passengers suffered traumatic head injuries and did not survive. The car caught on fire. Suggest appropriate interventions to prevent injuries and fatalities in this crash using the standard Haddon’s matrix given below.

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<th>PRE CRASH</th>
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<tr>
<td><strong>HUMAN FACTORS</strong></td>
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<td><strong>VEHICLE FACTORS</strong></td>
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<td><strong>ROAD &amp; ENVIRONMENT</strong></td>
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2. **International comparison (2)**

a. Following figure shows traffic crash trends in many countries. Mark the correct answer.

   i. There is no change in traffic risk in some countries
ii. Traffic fatalities started decreasing in few countries as early as 1950s.
iii. Traffic fatalities started declining in 1965-70 period in most countries
iv. Traffic fatalities changed marginally since 1965 -70.

b. What is the major difference in road safety policies before 1965 and after 1970?
   i. After 1970 stricter punishment and heavy fines were implemented
   ii. Highway standards and vehicle safety standards were implemented
   iii. Cities were redesigned.
   iv. Major emphasis on driver education

3. Data (1.5)
Mark the correct answer:
a. Primary source of traffic crash data is from the
   i. Hospital records
   ii. Police records
   iii. Census of India
   iv. NCRB report

b. Non-Fatal crash data recording is not as good as fatal crash data recording because
   i. Details are not available
   ii. Site details are not important
   iii. People avoid police and court involvement unless it is important for insurance claims
   iv. Non-fatal crash records are not required for national database

c. To improve quality of traffic crash data recording and reporting we should
   i. Redesign the police recording format to include more detailed information
   ii. Depend on automated electronic recording only
   iii. Simplify the current format to record objective information and involve PWD and RTO for additional information
   iv. Collect more details from hospitals
4. **Speed (5)**

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<td><strong>a.</strong> An increase in average speed by 1% can increase death rates by 3%-4%</td>
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<td><strong>b.</strong> Drivers become more careful when driving at higher speeds and notice everything on the road better</td>
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<td><strong>c.</strong> Injury severity is also related to the square of velocity</td>
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<td><strong>d.</strong> Increase in speeds does not matter if you are alone on that stretch of road</td>
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<td><strong>e.</strong> Braking distance is proportional to speed</td>
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<td><strong>f.</strong> Speed limit can vary based on the road function</td>
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<td><strong>g.</strong> Substantial speed reduction can be achieved by proper signage and markings</td>
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<td><strong>h.</strong> At high-speed field of visibility increases</td>
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<td><strong>i.</strong> Design speed and posted speed limit must be compatible</td>
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<td><strong>j.</strong> There is no difference in reaction time at a straight stretch versus at a junction</td>
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5. **Education (2)**

   a. Give 2 reasons why children road safety education is generally not very effective in ensuring safe behaviour on the road.

   b. Are there any situations where driver education may be effective? List at least two with reasons.
6. Enforcement (1.5)
   a. When an individual does not repeat her traffic offence because of having paid traffic fine in the past, what type of deterrence effect is this called?
      i. General Deterrence
      ii. Specific Deterrence
   b. Which of these factors does not determine the effectiveness of a motorcycle helmet?
      i. Speed of motorcycle
      ii. Proper strapping of helmet
      iii. Standard design of the helmet
      iv. Appropriate size of the helmet
   c. Drivers often slow down their vehicles when they detect a speed camera on the road. Name one automated speed enforcement measure with which drivers cannot easily modify their behaviour to avoid getting caught.

7. Hill Roads – Safety & Stability (2)
   a. Which of the following is not a measure recommended by IRC 99-2018 for hairpin curves/bends on hill roads?
      i. Provide rumble strips
      ii. Provide convex mirror to see oncoming vehicles
      iii. Provide pull-outs for vehicles
      iv. Post adequate speed limit sign posts
   b. Roller barriers are better for curves on hill roads when compared to traditional barrier systems because:
      i. They have a lower frequency of repair
      ii. They absorb impact and minimize vehicles bouncing off
      iii. They have high visibility due to coloration and self-luminescence
      iv. All of the above

8. Traffic Safety Legislation / Motor Vehicles Act (2)
   a. Direct statutory road safety protection in India comes from:
      i. Provisions of criminal law as codified in the Indian Penal Code, 1860
      ii. Provisions of the Motor Vehicles Act, 1988, as amended by the Motor Vehicles (Amendment) Act, 2019
      iii. Provisions of the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995
      iv. There is no direct statutory road protection in India
   b. If a driver deliberately runs over a pedestrian, which of the following sections, they will most likely be charged under:
      i. IPC § 304 – causing of death due to negligence
      ii. IPC § 336 – endangering life or personal safety of others
      iii. IPC § 338 – causing grievous hurt
      iv. None of the above
9. Junction operations, traffic signs and ITS (4)
   a. How are the road signs classified?
   
   b. To communicate the prohibition of movement, the sign shape shall be ____________
      with a ______________ background, ______________ symbol or arrow, and
      _______________ coloured diagonal bar.
   
   c. In addition to "longitudinal marking:, name at least three types of pavement marking
      classification:
   
   d. Name the ITS systems which deals with freight operations ________________
   
   e. Traffic signal violations are captured by ______________________________ system.
   
   f. Which is not an objective of traffic signals
      a. Orderly and efficient movement
      b. Maximize throughput and/or reduce delay
      c. Continuous flow of traffic
      d. Reduce frequency and severity of certain types of crashes.
      e. Appropriate levels of accessibility for pedestrians and side street traffic.

10. Construction Safety (4)
   a. State the most important reason for ensuring temporary structures safety in bridge
       construction.
   
   b. Why a bridge girder occasionally falls during the construction?
   
   c. What are the two most important precautions you would take to ensure that the
       shores do not collapse during the construction operation?
   
   d. Name the audit heads in which a highway construction zone safety audit needs to
      be conducted.