



Date: 27.11.2014

(AT-607)

Instructions:

1. Figures to right indicate full marks.
2. Draw neat figures wherever required.
3. Use of non-programmable calculator is allowed
4. Answers to both the sections should be written in separate Answer sheets.

SECTION - I

Q.1. Choose the correct answer: (1 mark each)

(05)

- a. Weight of two types of luggage blocks used for Luggage Retention Test are:
 - i. 10kg & 20 kg
 - ii. 18kg & 10 kg
 - iii. 30 kg & 10 kg
 - iv. 5 kg & 10 kg
- b. During a frontal crash, aim of crumple zone is to:
 - i. Absorb energy
 - ii. Increase stopping distance
 - iii. Decrease stopping distance
 - iv. Both a and b
 - v. Both a and c
- c. Rollover test is a part of :
 - i. US NCAP
 - ii. EuroNCAP
 - iii. US NCAP & EuroNCAP
 - iv. None of the above.
- d. ECE R 94 Offset frontal crash test is conducted at :
 - i. 56 km/h
 - ii. 60 km/h
 - iii. 64 km/h
 - iv. 50 km/h
- e. Femur bone is in:
 - i. Chest
 - ii. Knee
 - iii. Thigh
 - iv. Tibia
 - v. Pelvis

Q.2. Answer in brief (1 mark each)

(05)

- a. What are Injury Assessment Reference Values?
- b. Why Airbag is called a 'Secondary' restraint system?
- c. What are anti-submarine seats?
- d. List two types of Side Impact Tests.
- e. Define Serious Injury.

Q.3. Answer in brief (2 marks each)

(10)

- a. Write the chemical formulae which occur when an airbag is deployed.
- b. What are the types of accident data collection databases?
- c. What is HIC in terms of vehicle crash testing?
- d. Explain displacement systems & adjustment systems in seats with example.
- e. What is an NCAP? List at least four NCAP around world.

Q.4. Answer any six (5 marks each)**(30)**

- List the various types of Anthropomorphic Test Dummies and also list the corresponding tests in which they are used.
- Why is accident data collection a challenging task?
- Explain Typical Load on Seat Structure during a frontal crash.
- Explain at least three maxims for good restraint system along with example. List requirements of Instrument Panel / Dashboard.
- Explain in detail the injury mechanisms of an un-restrained driver in a frontal car collision. Describe in detail which body parts will suffer injuries and what type of injuries will occur.
- Explain the Abbreviated Injury Scale (AIS).
- For occupant protection, explain the functional difference between a seat belt and airbag.
Calculate the optimum firing time for the airbag deployment for a particular vehicle which crashes at 50 km/h.
 - The airbag must be inflated 80% when the driver reaches 125mm forward displacement
 - The airbag takes 30ms to reach 80% inflation (Obtained from High Speed Video)
 - 125mm forward displacement is reached after 40 ms (Obtained from High Speed Video)

SECTION II**Q.5. Choose a correct option and answer the following questions.****(05)**

- Range of IR spectrum starts is _____
a. less than 380 nm b. 380-3000nm c. 380 -780 nm d. None
- M3 Category of vehicles means _____
a. Seats ≥ 10 , Maximum mass > 5 tons b. Seats ≥ 10 , Maximum mass ≤ 5 tons
c. Seats ≤ 9 d. none
- Fitment of gas discharge lamps in-conjunction with the _____ and _____ :
a. Head lamp cleaner & automatic leveling device b. Only Head lamp cleaner
c. Head lamp cleaner & manual leveling d. Only Automatic leveling
- Active lightings are:
a. Lighting devices b. Signaling devices c. Lighting and signaling devices d. None
- Telltale colour of main beam head lamp is
a. Amber b. Green c. Blue d. Red

Q.6 Match the following according to the standards followed for the testing the respective devices for CMVR along with units referred to define the requirements**(05)**

Illumination	Cd/m ²	Signaling devices
Intensity	Lumen	Reflex Reflector
Lumen	Mcd/lux	Headlamp
Luminance	Candela	Bulbs
Coefficient of illumination	Lux	Number plate lamp

Q.7. Answer the following.**(20)**

- What is $V(\lambda)$? Explain the different types of $V(\lambda)$ as per vision adoption?
- What is intensity? Where this unit is used in automobile application for the measurement?
- Define colour temperature? And what is the day time colour temperature?
- What is HID lamps and its components? And what are advantages and disadvantages of this light source?
- What is head lamp leveling device? Explain objective and type of head lamp devices?
- Explain the technology progress of automotive lighting?

- g. What is horn? Explain construction and working principle of horn?
- h. What are head lamp cleaning devices and what is the necessity in automobile?
- i. What is solid angle and explain how this will used for measurement purpose.
- j. Why cosine correction of a detector is necessary and why a diffuser is put over the photodiode

Q.8 Solve the following (ANY FOUR)

(20)

- a. What in Lamberts Law and Inverse square law for illumination?
- b. What is glare and explain the type of glare? How it will interact with night driving?
- c. What is Photometry of human eye? Define three types of human eye which are active at different level of brightness?
- d. What are the different types of headlamps available in automotive applications and what are advantage and disadvantage?
- e. What is reflex Reflector? Explain the testing requirements and procedure of Reflex Reflector as per Indian standard applicable for CMVR?

******* All The Best *******