(3 Hours) **[Total Marks: 80]**

N.B. : (1) Question No.1 is compulsory
(2) Attempt any three out of remaining five questions
(3) Figures to the right indicate full marks
(4) Assume suitable data if necessary
(5) Illustrate your answers with sketches wherever necessary.

1 **Solve any four-** **20**

(a) State the duties of driver in case of accident

(b) State the necessity of permit and the vehicles exempted from permit

(c) Explain the taxation structure for goods vehicle

(d) State the motor vehicle registration mark system in India

(e) Write short note on BRTS

(f) Write short note on RO RO services and its advantages and disadvantages

2 (a) Write short note on dedicated freight corridor service? **10**

(b) Explain the rules and regulations regarding construction of motor vehicle. **10**

3 (a) Explain in detail the Intelligent transport system in goods transport operation **10**

(b) Write a detailed note on Traffic navigation and Global positioning system **10**

4 (a) Explain the Bus and crew scheduling procedure of STU **10**

(b) Explain the various term included in the surveyors and loss assessor report **10**

5 (a) What is solatium fund scheme? Explain the procedure for compensation of solatium fund scheme **10**

(b) Explain in detail about operation cost and revenues obtained from passenger transport operation **10**

6 (a) Describe the settlement of Insurance and Procedure of Investigation? Explain the need for insurance. **10**

(b) Describe the procedure for obtaining learners, permanent and renewal of driving license **10**

Time: 3 Hours **Marks: 80**

1. **Question No. 1 is compulsory.**
2. **Attempt any 3 questions out of 5 questions.**
3. **Figures to the right indicate full marks.**
4. **Illustrate your answers with sketches wherever necessary**

Q1	Attempt any four from following six questions	**20**
a	What is Aerodynamic Drag and its effect on fuel consumption	**5**
b	What are Spoilers and Air Dams	**5**
c	What is shape optimization?	**5**
d	What are the various sources of wind noise in an automobile?	**5**
e	Explain the Historic Development of Cars	**5**
f	Write a short note on the Ahmed body	**5**
Q2		**20**
a	Explain the process of formation and separation of a boundary layer and a separation bubble on a car	**10**
b	Explain different components of aerodynamic drag and their percentage contribution in drag formation	**10**
Q3		**20**
a	What are the different aerodynamic forces and moments? Write methods to calculate aerodynamic forces and moments.	**10**
b	Explain Aerodynamics of a race car	**10**
Q4		**20**
a	What are the performance characteristics and design considerations of high-performance vehicles?	**10**
b	Explain different features that can be incorporated into a vehicle to reduce aerodynamic drag.	**10**
Q5		**20**
a	Explain aesthetic aspect in automobiles	**10**
b	Explain the formation of wake region on different car body styles (hatchback, fastback and notchback).	**10**
Q6		**20**
a	Explain the effect of surface finish on the aerodynamics of a car	**5**
b	What are the external devices used to reduce drag in buses?	**5**
c	Discuss the effect of dirt accumulation on the performance of a vehicle	**5**
d	Flow Visualization Techniques	**5**

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(3 Hours) **Total Marks: 80**

N.B: (1) Question no 1 is compulsory.
(2) Attempt **any three** out of remaining five questions.

Answer the following questions (**Any four out of six**)

Q.1	**a**	Explain the advantages of using ultracapacitor in automobiles.	**05**
	b	Explain anyone type of battery rating.	**05**
	c	Explain the advantages of distributor less ignition system.	**05**
	d	Enlist the applications of actuators in automobile.	**05**
	e	Explain the need for multiplex wiring system.	**05**
	f	Explain anyone application of AI & ML in automobile	**05**
Q.2	**a**	Explain the need for batteries in automobiles. Also explain the working principle of lead acid batteries.	**10**
	b	Explain the requirements of charging systems. Also compare alternator with starter motor.	**10**
Q.3	**a**	Explain the role of communication protocols in automobiles. Also enlist different types of automotive protocols.	**10**
	b	What is fuzzy logic? Also explain its role in automotive systems with an example.	**10**
Q.4	**a**	Enlist different types of reflectors. Also explain anyone of them in detail.	**10**
	b	Explain V2V and V2I communication in detail.	**10**
Q.5	**a**	Explain the construction and working of solenoid actuator.	**10**
	b	Explain the working principle of integrated starter and alternator.	**10**
Q.6	**a**	Explain the electromagnetic interference in the context of automobiles.	**10**
	b	Explain the application of 48-volt technology in hybrid electric vehicles.	**10**

Time :(Three Hours) **Total Marks: 80**

Note: 1. Q1 is compulsory
2. Solve any three from remaining
3. Assume suitable data wherever required

Q.1	Write notes on. **(Any Four)**	**20**
	a) Product Lifecycle Phases b) Reason for implementing a PDM system c) Tools for virtual product development d) Methodological Evolution in Product Design e) Model analysis f) General framework for LCCA	
Q.2 a.	State and explain end of life cycle strategies.	**10**
b.	Define PDM. What are the barriers to PDM implementation.	**10**
Q.3 a.	Define Change Management. Why Change Management is important in PLM?	**10**
b.	Explain the Product Design Process and its phases in the Development Process.	**10**
Q.4 a.	Explain phases of Life Cycle Analysis in ISO Standards	**10**
b.	Explain the Role of FEM and CAD in VPD.	**10**
Q.5 a.	What is New Product Development (NPD)? Explain its Strategies.	**10**
b.	Importance of Product Design in the Context of the Product Development Process.	**10**
Q.6 a.	Define Life Cycle Assessment (LCA). Explain the fields of Application of Life Cycle Assessment.	**10**
b.	Define Design for Environment. Explain the guidelines for design for environment.	**10**

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Time: 3 hours **Marks: 80**

Q. 1 Answer **any five** of the following:

a) Explain Steering geometry angles.

b) Why suspension spring rates are kept low practically?

c) What is slip angle and explain its effect on performance.

d) What is rolling resistance? Enlist mechanisms which generate rolling resistance.

e) Write a note on road resistance.

f) What are the advantages of Ackerman steering Linkages.

Q. 2 a) Explain how aerodynamic drag is created with suitable diagram.

b) Derive equation to find out pair of double conjugate point. How it is applied to real Vehicle?

Q. 3 a) Explain wheel wobble and wheel shimmy.

b) What is body roll? Explain the importance of Anti roll bar in context with vehicle dynamics with its working.

Q. 4 a) Explain interconnected suspension with diagram. Why it is used in automobiles and how it is achieved?

b) Find the distance between the double conjugate points for the passenger car
Sprung mass: 900 kg, wheel base: 1.2 m, Distance of CG from front axle: 1.2 m,
Front suspension stiffness: 50 KN/m,
Rear suspension stiffness: 150 KN /m

Q. 5 a) Explain conicity and ply steer? How it affects vehicle performance

b) Explain the advantages of front wheel drive with suitable vector diagram.

Q. 6 Write short note on

a) Air suspension

b) Roll centre and roll axis

c) Central tyre inflation system

d) Active suspension.