(3 Hours) **80 Marks**

NB : (1) Question No 1 is compulsory
(2) Attempt any 3 questions from remaining 5
(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)	Explain the influence of aerodynamics on Light Cars and Trucks with respect to Fuel Consumption.	**5**
b)	How drag force is calculated Explain.	**5**
c)	Explain historical development of the shape of the car.	**5**
d)	How is drag force measured in wind tunnel?	**5**
e)	Discuss the aesthetic aspect in automobiles	**5**
f)	Explain attached & separated flows around vehicle body.	**5**
Q2		**20**
a)	What are pressure drag & friction (viscous) drag ? Also explain drag reduction technologies used for attached & separated flows.	**10**
b)	Explain how the performance & stability of a vehicle is achieved under the influence of forces and moments. Write expression for each.	**10**
Q3		**20**
a)	Explain different uses of a wind tunnel. And also describe the various construction elements and its working with sketch.	**10**
b)	Explain how aerodynamic forces affect the shape of race car.	**05**
c)	What are the performance charecteristics & design considerations of high performance vehicles?	**05**
Q4		**20**
a)	What are spoilers & air dams? Explain how they improve aerodynamics.	**05**
b)	Sketch any one type of wind tunnel	**05**
c)	Explain how the issue of air flow around the cars is addressed in detail with sketch. Indicate all regions in detail.	**10**
Q5		**20**
a)	What are various modifications of the cabin and trailer to reduce drag? Sketch & explain.	**10**
b)	Explain road testing method for drag calculations.	**05**
c)	Explain CFD simulation of car & advantages.	**05**
Q6	Write Short notes on	**20**
a)	Effect of surface finish on aerodynamics of car	**5**
b)	Design of High Efficiency Radiators	**5**
c)	Studies of Flows Around Bluff Bodies	**5**
d)	External devices to reduce drag in Bus	**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.
(3) Figures to the right indicate full marks.
(4) Illustrate your answers with sketches wherever necessary.

Q.1		Solve any four from following.	20
	a	Write a short note on Tourist and National Permits.	05
	b.	What are the different types of Tax levid on motor vehicle?	05
	c.	Differentiate between Comprehensive plus zero depreciation and Third party insurance.	05
	d.	Explain Fleet maintenance.	05
	e.	Explain importance of Management Information System (MIS) in transport operation.	05
Q.2		Attempt following.	20
	a.	Explain functions of Surveyor & Loss Assessor in case of claim settlement.	10
	b.	Explain Different types of forms and its importance.	10
Q.3		Attempt following.	20
	a.	Explain Different types of Tax at Vehicle Registration Renewal in detail.	10
	b.	Explain depot layouts in detail with neat sketch.	10
Q.4		Attempt following.	20
	a.	Explain Offences, penalties & procedures in detail.	10
	b.	Explain in detail about MACT (Motor Accident Claims Tribunal).	10
Q.5		Attempt following.	20
	a.	Explain different theory of fares-Basic principles of fare charging.	10
	b.	Explain in detail about Dedicated Freight Corridor (DFC) of Indian Railways.	10
Q.6		Attempt following.	20
	a.	Explain Rules for Special Purpose Vehicle (Off Road vehicle, Specially designed vehicle, Government Department Vehicle).	10
	b.	Write a short note on Bus Rapid Transport system (BRTS).	05
	c.	Write a short note on Traffic navigation.	05

Time : 3 Hours **Total Marks : 80**

N.B. **(1)** All questions carry equal marks.
(2) Question No. **1** is **Compulsory.**
(3) Attempt any **three** questions from remaining **five** questions.
(4) Figures to the right indicate full marks.
(5) Draw neat sketches wherever necessary.

Q.1) Write short note on any **four** of the following: **(20)**

A) Hall effect Sensor.

B) Bendix Drive

C) Ultra Capacitor.

D) Engine Immobilizer.

E) Combined current and voltage regulator.

F) Zebra Battery

Q.2) A) Explain the construction and working of Lead Acid battery with neat sketch. **(10)**

B) Explain construction, working, types and setting of Headlamp. **(10)**

Q.3) A) Explain in detail Distributor less Ignition System with neat sketch. Compare it with conventional ignition system. **(10)**

B) Compare Mild, Micro and plug in hybrid vehicles. **(10)**

Q.4) A) Explain construction and working of Alternator. What are the advantages of Alternator over Dynamo? **(10)**

B) Explain construction and working of Solenoid and Thermal actuator. **(10)**

Q.5) A) Write a short note on stepper motor and PID controller **(10)**

B) Explain in brief various cables, their sizes, color codes and wiring harness systems used in automotive vehicles. **(10)**

Q.6) A) Explain Fuel gauge and Oil pressure gauge. **(10)**

B) What is "Telematics" Technology? Discuss about its advantages, disadvantages and applications. **(10)**

Time: 3 Hours **Max Marks:80**

Note: 1. Q1 is compulsory
2. Solve any three from remaining

Q1 Solve **any four** questions **20**

A. Role of science & Technology in Sustainable design of products
B. Simultaneous engineering
C. Explain Product design for Environment.
D. What is PLM? State its need and scope and phases.
E. What is digital mockup? State its benefits and list software used for it.

Q.2 A. What do you mean by Design for X. How will you use design for X tools in the design process? **20**

B. Explain useful life extension strategies.

Q.3 A. Explain the general framework of LCCA. **20**

B. What is sustainable development? Explain role of science & technology in it.

Q.4 A. Discuss new product development process **20**

B. Explain cost analysis and life cycle approach in detail.

Q.5 A. Explain the strategies for recovery at the end-of-life cycle **20**

B. What is the virtual product development process? Write its applications and advantages.

Q.6 A. Explain the product life cycle in detail with suitable example **20**

B. Explain various reasons for implementation of PDM system. Explain various barriers for PDM implementation

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Time: 3 Hours **Marks: 80**

Note: 1. First Question **Q.1** is compulsory.

2. Attempts **any 3 question**s from the remaining 5 (Q.2 – Q.6) questions

3. Draw neat and labeled diagram wherever necessary.

4. Assume suitable data wherever necessary.

Q.1 Attempt **any four** out of six questions. 20 Marks

a. Define the following terms:

i) Aerodynamic Drag

ii) Aerodynamic Lift

iii) Side force

iv) Rolling Resistance

v) Total Road Load

b. Sketch and explain in detail about "SAE Tyre Axis System".

c. Explain Variable Rate Leaf Spring .

d. Explain different types of Sources of Vibrations.

e. Explain different types of Steering Geometry with suitable Sketches.

f. Explain the Central Tyre Inflation System?

Q.2 Attempt the following questions:

a. Derive the equation to calculate Double Conjugate Points. 10 Marks

b. Derive the equations for pitch and bounce motion Frequencies of Vehicle. 10 Marks

Q.3 Attempt the following questions:

a. Prove that $C_{12} = C_{21}$ for Equalizing type of Suspension. 10 Marks

b. Find the double conjugate points for following data: Total mass = 800 kg, Sprung Mass = 727 kg, Wheelbase = 2.286 m, Front/Rear weight distribution= 63/67, Front suspension rate K_1=21.7 kN/m and Rear suspension rate K_2=25 kN/m. 10 Marks

Q.4 Attempt the following questions:

a. Explain the influence of Front Wheel drive and Four wheel Steering. 10 Marks

b. Explain the Tyre Construction and with suitable sketch and comment on Tyre Vibration. 10 Marks

Q.5 Attempt the following questions:

a. What is Vibration Isolation? Explain the Effects of Damping the Vibration. 10 Marks

b. Locate the Roll Centre Graphically for the followings: 10 Marks

i) Four link type suspension

ii) McPherson strut suspension

iii) Swing axle Type suspension

iv) Hotchkiss suspension

Q.6 Write short notes on **any four** of the followings: 20 Marks

a. Conicity and Plysteer.

b. Anti-Squat Geometry.

c Tire Magic Formula.

d Active Suspension.

e Maurice Olley's criteria.

f Understeer and Oversteer.

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