Time: 3 hour Max Marks:80

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

Q1	A. Evolution of Models for Product Life Cycle Cost Analysis B. Importance & Benefits of PLM C. Explain Product design for manufacturability. 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.	20
Q.2	A. Explain the concept of New Product Development (NPD) and its Strategies. B. Explain Life Cycle Environmental Strategies and Considerations for Product Design.	20
Q.3	A. Explain the general framework of LCCA. B. What is sustainable development? Explain role of science & technology in it.	20
Q.4	A. List down at least ten reasons for implementing a PDM system and explain barriers to PDM implementation. B. Explain cost analysis and life cycle approach in detail.	20
Q.5	A. Explain the strategies for recovery at the end-of-life cycle B. What is the virtual product development process? Write its applications and advantages.	20
Q.6	A. Explain Modeling and simulations in Product Design with suitable examples. B. Explain the process of Developing PLM Vision and PLM Strategy.	20

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

NB: - 1) Draw neat sketches wherever necessary.
2) **Q. No. 1** is compulsory.
3) Solve any **three** questions from the remaining five questions.
4) Assume suitable data wherever necessary.

Q.1 Answer **Any Four** of the following: **20**

a) What is rolling resistance? State the mechanisms which generate the rolling resistance.
b) Explain "Conicity and ply-steer".
c) Describe "Magic tyre formula"
d) Write various properties of double conjugate points
e) Sketch and explain "Variable rate leaf spring"
f) Define Ride and explain Ride dynamic system.

Q.2 a) Find the position of double conjugate points for a vehicle with the following data: **10**
Total mass = 1040 kg
Sprung mass = 945 kg
Wheel base = 2.268m
Front/Rear weight distribution = 54/46
Front suspension rate = 21.7 KN/m
Rear suspension rate = 25.0 KN/m
Take: $(K^2/L_1L_2) = 1$

b) Derive the equations for pitch and bounce motion frequencies of a half car model. **10**

Q.3 a) What is "Roll center"? Locate the Roll Centers Graphically with neat sketch for the followings: **10**
i. Four link type suspension
ii. Mac-pherson strut suspension
iii. Swing axle Type suspension
iv. Hotchkiss suspension

b) Derive an equation to find out pair of double conjugate points with suitable sketch. **10**

Q.4 a) Describe **Any Two** of the followings: **10**
I. SAE Tyre axis system"
II. Mechanics of Air Flow around the vehicle
III. Active Suspensions

b) Find the geometry that would be necessary to achieve100% anti-squat in the rear suspension and find the geometry to achieve full anti-pitch for the solid axle rear wheel drive vehicle as described below:
The designed weight of the vehicle=18046.43N. The front and rear suspension rates are 21.7kN/m and 25kN/m respectively; The CG height=0.508m; Wheel base=2.744m.
Also find the pitch rate, when the geometry is set for 100% anti-squat in the rear suspension. **10**

Q.5 a) Explain the Two main types of tyre constructions with neat sketch. Also explain tyre properties affecting vehicle roll over. **10**

b) Find the pitching & bouncing frequencies for a passenger car having the following data: **10**
Sprung mass =1450 Kg; Wheel base= 3.05 m; Position of CG from front axle=1.37m;
Front stiffness rate= 33KN/m;
Rear stiffness rate=33.75KN/m; Use Radius of gyration: K =1.22 m

Q.6 Write short note on **(Any Four)** **20**

a) "Understeer" and "oversteer".
b) Anti dive suspension geometry
c) "Mourice Olley's criteria"
d) Wheel wobble and wheel shimmy
e) Sensors used for Automobile control.

Time: (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		Attempt following.	**20**
	a	Explain Accidents, Causes & its analysis.	**10**
	b.	Explain the importance of Traffic navigation and Global positioning system in traffic management.	**10**
Q.2		Attempt following.	**20**
	a.	Write a short note on One time tax.	**05**
	b.	Explain the particulars of vehicles involved in accident.	**05**
	c.	Explain Planning, Scheduling operation & control of passenger transport operation.	**10**
Q.3		Attempt following.	**20**
	a.	Explain rules regarding Storage & transportation of petroleum products in India.	**10**
	b.	Explain rules regarding construction of motor vehicles	**10**
Q.4		Attempt following.	**20**
	a.	Explain different types of Insurance & its significance	**10**
	b.	Explain in detail about Operation cost and Revenues obtained from Passenger Transport Operation.	**10**
Q.5		Attempt four following.	**20**
	a.	Explain the tax which is paid at Vehicle Registration Renewal.	**05**
	b.	Explain Hit & Run case in detail.	**05**
	c.	Write a short note on Fleet maintenance.	**05**
	d.	Write a short note on Intelligent Transport System.	**05**
	e.	Write a short note on National Permits.	**05**
Q.6		Attempt following.	**20**
	a.	Explain Offences and penalties for various traffic offences.	**10**
	b.	What kind of information is furnished in Surveyor's report?	**05**
	c..	Explain Economics & records in relation to passenger transport operations.	**05**

3 Hrs. **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

Q.1	Attempt any four questions from the following six	**20**
a)	What is aerodynamic drag & its effect on fuel consumption?	**05**
b)	Sketch flow field around the car with nomenclature & show regions of attached and separated flow.	**05**
c)	What are the main performance characteristics high performance cars?	**05**
d)	Discuss important aerodynamic parameters of buses & influence of front radii on drag.	**05**
e)	Sketch any one type of wind tunnel and name sections of it.	**05**
f)	What is aesthetic design in relation to vehicles? Discuss its importance.	**05**
Q.2		**20**
a)	What are different aerodynamic forces & moments acting on a vehicle while in motion? Sketch and write expression for each.	**10**
b)	Define Reynolds's number & discuss its significance in vehicle aerodynamics. What are pressure & friction (viscous) drag? Explain with expressions.	**10**
Q.3		**20**
a)	Analyse the influence of rear end of following car designs on aerodynamics (i) Squareback (ii) Fastback (iii) Notchback with sketches showing formation of vortices.	**10**
b)	Explain how drag force and pressure coefficient are measured in wind tunnel?	**05**
c)	Explain CFD simulation for vehicle aerodynamics.	**05**
Q.4		**20**
a)	Explain how the following issues of aerodynamics are addressed (i) Performance / Stability of car (ii) Flow over car (iii) Engine cooling (iv) HVAC in brief.	**10**
b)	What are the limitations of wind tunnel simulation?	**05**
c)	Discuss 'Car as a bluff body.'	**05**
Q.5		**20**
a)	Discuss the effect of crosswinds and yaw angle on drag force in case of truck-trailer.	**05**
b)	Explain how drag versus lift issues is addressed in racing cars.	**05**
c)	What are the limiting conditions for (i) Stagnation point (ii) Flow separation	**05**
d)	What are the ranges of drag coefficient values for the following category of vehicles (i) Cars (ii) Minibus (iii) Bus (iv) Truck (v) Truck-trailer	**05**
Q.6	Write notes on.	**20**
a)	Low drag generic body shapes	**05**
b)	What are spoilers and air dams?	**05**
c)	What is ground effect & how it reduces the lift?	**05**
d)	Flow visualisation techniques.	**05**

****

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

N.B.: (1) Question **No.1** is **Compulsory**.
(2) Attempt **any three** questions from the **remaining** questions.
(3) Assume **suitable** data wherever required but **justify** the same.
(4) **Figures** to the **right** indicate **full marks**.
(5) Answer to each new question must start on a **fresh page**.

1. (a) What type of data analytics is used in healthcare? **[5]**
   (b) Which imaging technologies do not use radiation? Explain those technologies in brief. **[5]**
   (c) What you mean by the term Natural Language Processing for clinical/medical text data. **[5]**
   (d) Define Advanced Data Analytics for Healthcare with six real-world applications. **[5]**

2. (a) Define Phenotyping Algorithms with key aspects. **[10]**
   (b) What is visualization? Explain different types of visualization techniques, tools with advantages and disadvantages. **[10]**

3. (a) Illustrate Predictive Modelling in Healthcare with at least two examples. **[10]**
   (b) Describe the following: - **[10]**

   1. BAN
   2. Dense/Mesh area network for smart living environment
   3. Senor Technology
   4. Image Registration
   5. Feature Extraction

4. (a) What are the components of EHR? What are the barriers for adopting EHR? **[10]**
   (b) Explain types of Fraud detection in healthcare with the help of example. **[10]**

5. (a) What are the challenges one may face while processing Covid clinical reports? **[10]**
   (b) Define Data science with applications of healthcare data analytics. **[10]**

6. (a) How will we analyze Mental health status of someone using their tweets on twitter? **[10]**
   (b) Define Biomedical Imaging Modalities with their Applications. **[10]**

---

3 Hours **(80 Marks)**

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) **Attempt any four out of six questions**

A) Explain the maintenance and testing of Lead acid battery. **(5)**

B) Enlist any five intelligent vehicle systems. **(5)**

C) Explain the electromagnetic interference in the context of automobile. **(5)**

D) Explain the applications of actuator in vehicle with an example. **(5)**

E) Explain the application of 48 Volt technology for EVs. **(5)**

F) Explain anyone application of artificial intelligence in automobile. **(5)**

Q.2) A) Enlist different types of batteries. Explain various parts of lead acid battery with a neat labelled diagram. **(10)**

B) Explain the application of artificial intelligence in automobile with an examples. **(10)**

Q.3) A) Why automotive wiring requires color coding? Explain at least five color codes used in vehicles application wise. **(10)**

B) Discuss various communication protocols used in vehicles. Also explain the most commonly used protocol in detail. **(10)**

Q.4) A) Enlist different types of intelligent vehicle system. Explain any one type of intelligent vehicle system in detail. **(10)**

B) Explain the role of reflectors used in vehicles. Also explain parabolic reflector with a neat labelled diagram. **(10)**

Q.5) A) Explain the construction and working of solenoid actuator in detail. **(10)**

B) Explain the need for alternator in a vehicle. Also explain the working principle of alternator with a neat labelled diagram. **(10)**

Q.6) A) Explain the significance of fuzzy logic in automotive engineering with an example. **(10)**

B) Compare mild hybrid, micro hybrid and plug in hybrid in detail. **(10)**

****

Duration: 3hrs **[Max Marks: 80]**

NB:
(1) Question No.1 is Compulsory
(2) Attempt any three questions out of remaining five.
(3) All questions carry equal marks
(4) Assume suitable data, if required and state it clearly.

1. Attempt **any FOUR** **[20]**
   a. Discuss CIA Triad in Information Security.
   b. Explain concept of High Availability.
   c. Illustrate various XSS attacks
   d. Explain Information Security issues in Cloud computing
   e. Explain various threats to Access Control.

2. a. Describe Risk assessment techniques outlined in ISO31010 framework. **[10]**
b. Define Intrusion Detection System. Explain in detail IDS techniques. **[10]**

3. a. Explain Availability, Mean Time Between Failure (MTBF), Mean Time to Repair (MTTR), and Calculate the Availability for a product has MTBF of 200hrs and MTTR of 10 hrs. **[10]**
b. Explain in detail COBIT Framework. **[10]**

4. a. Describe various Disaster Recovery Techniques. **[10]**
b. Explain any two different Access Control Models from the following. **[10]**
   a. Discretionary,
   b. Mandatory,
   c. Role based
   d. Rule-based.

5. a. Compare the quantitative and qualitative risk assessment approaches. **[10]**
b. Explain various types of Audits in Windows Environment. **[10]**

6. a. What are the key characteristics of OCTAVE approach? **[10]**
b. What are the objectives of IT ACT? Explain in detail IT ACT 2000 and IT ACT 2008. **[10]**