3 HRS **[Total Marks: 80]**

N.B.: (1) **All** questions carry **equal** marks.
(2) Question No. **1** is **compulsory**. Attempt any three questions from remaining.
(3) Figures to the **right** indicate full marks.
(4) **Illustrative answers** with neat **sketches** wherever required.

Q1.a) Explain Evolution of Casting Technology. **05**

b) Enlist various Airbag materials and their property requirements. **05**

c) With the help of neat sketch explain Hand Lay-up process. **05**

d) Mention properties and composition of glass used in automobiles . **05**

Q2.a) Explain Light weighting of vehicles with emphasis on material selection. **10**

b) Describe use of Steel-Shift towards Aluminium and magnesium alloys for car bodies. **10**

Q3.a) Write down different types of plastics and its applications in automobiles. **10**

b) With the help of neat sketch explain Resin transfer moulding. **10**

Q4.a) What is MR fluid? Explain application of MR fluid in Automobile Industry. **10**

b) Explain basic concepts and sequences of application of paint technology. **10**

Q5.a) Explain relevance of smart materials in Automobile Industry. **10**

b) Explain Ashby charts for making a good selection of materials in automobiles. **10**

Q6. Write short notes. (Any Four) **20**

a) Seat belt requirements

b) Trends for Biocomposites in Automobiles

c) Nano coatings for corrosion resistance

d) Electrorheological Fluid

e) Use of ceramics as fuel injectors

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Time: Three Hours **Max. Marks: 80**

Instructions:

- Question No. 1 is compulsory.
- Answer any three from the remaining five questions.
- Assume suitable data whenever required with proper justification.
- Figures to the right indicate full marks

Q.1 **Attempt any four of the following. All Sub questions carry equal marks** **20**

(a) Explain the different sensors and controllers used in EVs.
(b) How battery chargers are classified? Explain in brief.
(c) Draw a typical power flow diagram for Series Hybrid Vehicle and explain in detail.
(d) Write down the barriers affecting the growth of EVs in India.
(e) Describe the importance of FAME and explain its significance.

Q.2 (a) Explain the different configurations of electric vehicles with its applications. **10**

(b) How does hybrid electric vehicle work? Explain types of hybrid electric vehicles with applications. **10**

Q.3 (a) What do you mean by battery in electric vehicle? Explain the terms SoC, DoD, SoH, Specific Energy and Specific Power. **10**

(b) Explain the working principle of any one EV Motor and write down the functions of components involved in the control system process of typical motor with relevant schematic sketch. **10**

Q.4 (a) Elaborate the overall power train architecture and components of the typical electric vehicle with regenerative braking system and explain working of it in detail. **10**

(b) What is the need of control system in hybrid vehicle? Explain the process of energy control using energy management system in a typical parallel hybrid vehicle. **10**

Q.5 (a) Explain the advanced batteries used in electric vehicles with advantages and disadvantages. **10**

(b) What do you understand from the concept of Hybridization of Energy storage devices? Explain the functions of ultra capacitors in detail. **10**

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

(a) Transition to EV in India
(b) PEMFC Working with advantages and disadvantages.
(c) AFC Working with advantages and disadvantages
(d) V2G & G2V Concept
(e) Battery Management System and its importance.

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3 hours **80 Marks**

Instructions:

1. **Question Number 1 is Compulsory**
2. Attempt **ANY THREE** Questions out of remaining **FIVE**
3. Use illustrative diagrams wherever required

Q1) Attempt any FOUR questions

	a)	What is the need of new product development in the world?	**05**
	b)	What Is Product Architecture?	**05**
	c)	Draw the flow chart of Concept Development Process in the product design.	**05**
	d)	Why it is necessary to integrate the basic forms and elements of a product like balance, rhythm and proportion?	**05**
	e)	What are the principles of Design for Manufacturing and Assembly (DFMA)?	**05**
	f)	List ANY FIVE Prototyping techniques used in manufacturing a product.	**05**
Q2)	**a)**	Explain SIX steps/phases of the Generic product development process with flow chart.	**10**
	b)	Define market research. List and explain the methods of market research required in the product design and development.	**10**
Q3)	**a)**	What do you mean by concept selection? Explain concept screening and concept scoring methodology giving example.	**10**
	b)	What Is Product Architecture? Explain the Steps in developing product architecture.	**10**
Q4)	**a)**	Explain the process of identifying customer needs in concept development process.	**10**
	b)	What is Quality Function Deployment (QFD)? Explain the phases of QFD.	**10**
Q5)	**a)**	Draw House of Quality (HoQ) and highlight the customer matrix part in (HoQ)? Explain Voice of the Customer as an input to QFD.	**10**
	b)	Define creative thinking. List any FIVE Creativity and problem-solving methods. Explain the Brainstorming Technique used in product development.	**10**
Q6)	**a)**	What is balance, rhythm and proportion? Explain the importance of these elements in product design and development giving examples.	**10**
	b)	Write short notes on Design for Environment and Design for Serviceability.	**10**

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Time: 3-hour **Max. Marks: 80**

N.B.: (1) Question **NO. 1** is Compulsory.
(2) Attempt any **THREE** questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required, and state it clearly.
(5) Notations carry the usual meaning.

Q. 1 Answer any **FOUR.** **20**

a. Explain the necessity of project management in achieving organizational goals.

b. What is Goldratt's critical chain method?

c. What are the numeric and non-numeric models of project selection?

d. What is concurrent engineering?

e. Explain various Reasons for project termination.

f. Define scope creep. What are two ways to control it in a project?

Q.2 a. Describe the typical and atypical project life cycles, highlighting the stages in the stage-gate process. **10**

b. Assume that ABC Inc. is considering two projects, namely Project X and Project Y, and wants to calculate the NPV for each project. Both project X and project Y are four-year projects, and the cash flows of both projects for four years are given below: **10**

Year	Project A Cash Flows in Rs.	Project B Cash Flows in Rs.
1	5000	1000
2	4000	3000
3	3000	4000
4	1000	6750

The firm's cost of capital is 10% for each project, and the initial investment amount is Rs.10,000. Calculate the NPV of each project and determine in which project the firm should invest.

Q.3 a. What are the advantages and risks of outsourcing in project management? **05**

b. List the key components of a project communication plan. **05**

c. Describe the methods of project cost estimation and differentiate between top-down and bottom-up budgeting approaches. **10**

Q.4 a. What are the different types of contracts? Draw the graph showing risk exposure to the buyer and seller in various contract types. **10**

10

b. A small project consisting of ten activities has the following characteristics:

Activity	Preceding Activity	Time Estimate weeks		
		Optimistic	Most likely	Pessimestic
A	–	4	5	12
B	–	1	1.5	5
C	A	2	3	4
D	A	3	4	11
E	A	2	3	4
F	C	1.5	2	2.5
G	D	1.5	3	4.5
H	B,E	2.5	3.5	7.5
I	H	1.5	2	2.5
J	F,G,I	1	2	3

Determine the critical path.

Q.5 a. Explain the Probability and impact matrix. What are the risk response strategies for negative risks(threats) and positive risks(opportunities). **10**

b. Explain the four stages of team development and growth. **10**

Q.6 a. Discuss the various reasons for project termination and explain different types of project termination. **10**

b. Explain the importance of ethics in projects. **05**

c. Explain the Triple constraint of project management in brief. **05**