(3 Hours) [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) Write short note on Body design concepts with a focus on light weighting. **05**

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

c) With the help of neat sketch explain Spray up process. **05**

d) Explain basic concepts of paint technology **05**

Q2.a) Describe need to shift new materials and risk in adopting new materials **10**

b) Describe evolution of casting technology **10**

Q3.a) Briefly describe various plastics and composites used in making dashboards. **10**

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

Q4.a) Explain various use of Electrorheological (ER) fluid in automobiles. **10**

b) Explain various approaches in tempering of glass for improved toughness. **10**

Q5.a) Explain Electrochromic rear-view mirrors. **10**

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

Q 6. Write short notes. (Any Four) **20**

a) Applications of Magnetorheological fluids

b) Seat belt requirements

c) Trends for Biocomposites in Automobiles

d) Scratch resistant paints

e) Fuel injector materials

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

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Note-

1. **Question one is compulsory.**
2. **Solve any three out of remaining five.**

Q.1 **Explain any four of the following.** **20**

- **a** Definition of Product quality and service quality
- **b** Significance of Quality management
- **c** Draw diagram Root cause analysis
- **d** List out Barriers to TQM work
- **e** Explain Win –Win policy with supplier.

Q.2 **a** The data shows the sample mean and range for 10 samples for size 5 each. Find the control limits for mean chart and range chart. **10**

Sample	1	2	3	4	5	6	7	8	9	10
Mean	21	26	23	18	19	15	14	20	16	10
Range	5	6	9	7	4	6	8	9	4	7

b Explain Quality management system certification process **10**

Q.3 **a** Explain Six sigma definition, concept and methodology **10**

b Explain various steps involves implementing TQM in manufacturing industries with case study **10**

Q.4 **a** What is ISO 9000? Explain ISO 9000 system implementation process. **10**

b Describe the contribution of Tauguchi to quality management. **10**

Q.5 **a** Explain the purpose of giving Malcom Baldridge quality award. **10**

b Explain the following charts **10**

(i) Producer risk
(ii) Consumer risk
(iii) AQL
(iv) LTPD

Q6 **a** 1.Explain the Barriers of TQM' **5**

2.Write note on cost of quality **5**

b What is BPR concept? List out the process involves in the BPR concept implementation **10**

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3 Hours **Marks : 80**

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)	Define new product. List various types of new products.	**05**
b)	Draw figure showing the steps or phases of the product development process.	**05**
c)	Define Quality Function Deployment (QFD). List the steps of QFD.	**05**
d)	Differentiate between engineering design and industrial design.	**05**
e)	What do you mean by golden ratio of proportion? Give examples of golden ratio uses in day-to-day life.	**05**
f)	Explain the term Design for Environment.	**05**
Q2) **a)**	What is product life cycle? Explain the four phases of product life cycle with diagram.	**10**
b)	Define market research. Explain the methods of market research required in the product design and development.	**10**
Q3) **a)**	For redevelopment of a consumer product "**college backpack**", prepare concept selection matrix. Generate the concept, screen the concept, score the concept and rank the concept.	**10**
b)	Explain in brief various concept generation and selection methods.	**10**
Q4) **a)**	What is House of Quality (HoQ)? Explain various components of HoQ.	**10**
b)	Draw House of Quality (HoQ) for a consumer product **"college backpack"**.	**10**
Q5) **a)**	Define creative thinking and creativity. List the Creativity and problem-solving methods. Explain any ONE method.	**10**
b)	What are the basic forms and elements of a product? Why it is necessary to integrate the basic forms and elements? Explain with examples.	**10**
Q6) **a)**	What is DFMA? Explain the steps used in DFMA giving examples.	**10**
b)	Write short notes on a) 3 D printing method b) Role of computers in product design and manufacturing	**05** **05**

(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	**(a)**	Explain fundamental operating principle of Fuel cells	**5**
	(b)	Write short note on Types of chargers used in Electric Vehicles.	**5**
	(c)	Define battery parameters SoC, DoD, SoH, Specific Energy and Specific power.	**5**
	(d)	What is full form of FAME? Explain briefly about FAME-I and FAME-II scheme by Govt. of India.	**5**
	(e)	Write brief note on transition to EV's and Global warming	**5**
2	**(a)**	How many different types of Hybrid vehicles configuration do you know? Explain power flow control in at least 2 of them with neat sketches.	**10**
	(b)	Sketch various Electric Vehicles Drivetrain Configurations.	**10**
3	**(a)**	Enlist various Electric Motors which can be used in Electric Vehicles and explain working of any one in detail with neat diagram.	**10**
	(b)	Discuss in detail the concept, working and advantages of Regenerative braking in EV and HEVs.	**10**
4	**(a)**	Enlist different types of Hybrid architectures. Explain Parallel architecture with power flow diagram for all modes of operation.	**10**
	(b)	Explain LFP and NMC Li-ion battery chemistry with advantages and disadvantage.	**10**
5	**(a)**	What is On board and Off board charging in EV's? Also explain different types of Pins and connectors used in EV charging systems.	**10**
	(b)	Explain working of PEMFC and AFC with neat labeled diagram and their advantages and disadvantages.	**10**
6		Write short notes on	
	(a)	V2G & G2V concept	**5**
	(b)	Hybridization of Energy storage devices	**5**
	(c)	Transition to EV's and Global warming	**5**
	(d)	Need of BMS in Electric vehicles	**5**

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