

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: B.Tech  
BRANCH: PIE**

**SEMESTER : VI  
SESSION : SP/2025**

**SUBJECT: PE349 LEAN MANUFACTURING & SIX-SIGMA**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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Q.1(a)	An automotive parts manufacturer is facing issues with high inventory costs and long lead times. As a lean consultant, analyze the situation and recommend whether a push or pull system would be more appropriate. Justify your choice with reference to lean principles.	[5] 1	3
Q.1(b)	A global e-commerce company adopts Just-In-Time inventory management to streamline its warehouse operations. Due to supply chain disruptions, it experiences frequent stockouts. Discuss the risks and limitations of JIT in this context and suggest modifications or complementary strategies to mitigate these risks.	[5] 1	3
Q.2(a)	A manufacturing plant experiences frequent equipment breakdowns that halt production. Using the 5 Whys technique, explain how the company can identify the root cause and suggest preventive actions.	[5] 2	4
Q.2(b)	Define Single-Minute Exchange of Die (SMED) and explain its significance in improving production efficiency. Outline the key steps involved in successful SMED implementation.	[5] 2	2
Q.3(a)	Describe the steps of the PDCA cycle and explain its role in the implementation of continuous improvement initiatives in a manufacturing environment.	[5] 3	2
Q.3(b)	Define Value Stream Mapping and explain its significance in identifying and eliminating waste in production systems. How does it support lean decision-making?	[5] 3	3
Q.4(a)	Explain how FMEA can be used in product design to prevent potential failures. Describe the steps involved in conducting an FMEA. What is the significance of the Risk Priority Number (RPN), and how should it guide decision-making?	[5] 4	3
Q.4(b)	Compare and contrast the roles of FMEA and QFD in quality planning. How can these tools complement each other in reducing design and process risks?	[5] 4	2
Q.5(a)	What are the key differences between Lean and Six Sigma? How does Lean Six Sigma combine the strengths of both methodologies?	[5] 5	2
Q.5(b)	Define Six Sigma and explain how it aims to reduce process variability. What is the DMADV model, and how does it differ from DMAIC? Provide examples of when each would be used in practice.	[5] 5	2

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