Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 11 – 12- 2025 **Time:** 01:00pm – 04:00pm

School: SOE	**Program:** B. Tech. MECHANICAL ENGINEERING	
Course Code: MEC3441	**Course Name:** Reliability and Maintenance in Oil and Gas Industry	
Semester: VII	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	12	12	24	24	24	24

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Define Risk-Based Inspection (RBI).	**2 Marks**	**L1**	**CO1**
2.	What is the basic principle of Magnetic Particle Testing (MPT)?	**2 Marks**	**L1**	**CO2**
3.	Define 'functional failure' in the context of RCM.	**2 Marks**	**L1**	**CO3**
4.	What is a 'wear-out' failure pattern?	**2 Marks**	**L1**	**CO3**
5.	What is SAP PM primarily used for in maintenance?	**2 Marks**	**L1**	**CO4**
6.	Define 'downtime' as a maintenance performance indicator.	**2 Marks**	**L1**	**CO4**
7.	What is Predictive Maintenance (PdM)?	**2 Marks**	**L1**	**CO5**
8.	Name one industry standard relevant to asset management mentioned in the course.	**2 Marks**	**L1**	**CO5**
9.	What is the 'Sort' (Seiri) step in the 5S methodology?	**2 Marks**	**L1**	**CO6**
10.	Define the acronym SMED.	**2 Marks**	**L1**	**CO6**

Part B

Answer the Questions. **Total Marks 80M**

11	**a.**	Explain the key differences between Reliability-Centered Maintenance (RCM) and Condition-Based Monitoring (CBM).	**10 Marks**	**L2**	**CO1**
	b.	Explain the role of NDE acceptance criteria and design codes when evaluating the results of an Ultrasonic Test (UT) on a pipeline.	**10 Marks**	**L2**	**CO2**
		Or			
12	**a.**	Explain the fundamental concepts of reliability engineering, including the key metrics MTBF (Mean Time Between Failures) and MTTR (Mean Time To Repair).	**10 Marks**	**L2**	**CO1**
	b.	Describe the working principle of Die Penetrant Testing (DPT). What are the main steps involved in the process, from surface preparation to inspection?	**10 Marks**	**L2**	**CO2**

13	Develop a simple 5x5 risk matrix and explain how it is used to prioritize maintenance tasks based on the consequence and probability of failure.	**20 Marks**	**L3**	**CO3**
	Or			
14	Explain the philosophy of Kaizen (Continuous Improvement). How can this be applied to a maintenance team's daily Standard Operating Procedures (SOPs)?	**20 Marks**	**L3**	**CO6**

15	Analyze the workflow of a maintenance work order in SAP PM, from 'Notification' to 'Execution' and 'Confirmation'. How does this digital process help in comparing the effectiveness of maintenance programs and optimizing inventory compared to a traditional paper-based system?	**20 Marks**	**L4**	**CO3**
	Or			
16	Evaluate the use of Oracle Primavera for planning a major maintenance outage (shutdown). Analyze how this tool, when integrated with a CMMS (like SAP), can be used to optimize the schedule, manage resources (labor and materials), and minimize plant downtime.	**20 Marks**	**L4**	**CO6**

17	Analyze a customized preventive maintenance (PM) program for a set of static equipment (e.g., pressure vessels). How would you integrate insights from Risk-Based Inspection (RBI) and industry standards (like API 510/570) to optimize the inspection intervals and scope?	**20 Marks**	**L5**	**CO5**
	Or			
18	Design and analyze a predictive maintenance (PdM) program for the rotating equipment in a processing plant (e.g., pumps, compressors). Your analysis must include the selection of digital tools (sensors, IoT) and the use of industry data standards (like ISO 14224) for collecting failure data.	**20 Marks**	**L5**	**CO5**