Reg. No.																

Question Paper Code	13994

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Third Semester

Industrial Safety Engineering

24PISEL301 - RELIABILITY ENGINEERING

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	Reliability function R(t)R(t)R(t) gives: (a) Probability of system failure by time ttt (b) Probability of system survival up to time ttt (c) Failure rate at time ttt (d) Average life of the system	*1*	*K1*	*CO1*
2.	Mean Time to Failure (MTTF) is used for: (a) Repairable systems (b) Non-repairable systems (c) Systems with periodic maintenance components (d) Systems with standby	*1*	*K1*	*CO1*
3.	The exponential distribution is most commonly used to model which type of failure rate? (a) Increasing failure rate (b) Decreasing failure rate (c) Constant failure rate (d) Random failure rate	*1*	*K1*	*CO2*
4.	In hazard plotting, the slope of the plotted line on a Weibull probability paper represents: (a) Mean time to failure (b) Scale parameter (η) (c) Shape parameter (β) (d) Reliability index (R)	*1*	*K1*	*CO2*
5.	The Reliability Block Diagram (RBD) is used to represent: (a) Statistical variation in component life (b) Logical configuration of components in a system (c) Failure mode classification (d) Stress–strength relationship	*1*	*K1*	*CO3*
6.	The cut set in Fault Tree Analysis refers to: (a) A set of events that ensures system success (b) A combination of events that causes system failure (c) A redundant subsystem (d) The minimal path to reliability	*1*	*K1*	*CO3*
7.	The main purpose of reliability testing is to: (a) Improve product design appearance (b) Determine and verify product reliability under specified conditions (c) Estimate marketing potential of the product (d) Increase production rate	*1*	*K1*	*CO4*
8.	Reliability and life cycle cost analysis are performed together mainly to: (a) Optimize marketing expenses (b) Balance reliability improvements with total system cost (c) Maximize warranty period (d) Determine maintenance frequency only	*1*	*K1*	*CO4*
9.	Risk is generally defined as: (a) The possibility of system success (b) The product of the probability of occurrence and the consequence of an event (c) The number of safety audits conducted per year (d) The total cost of system maintenance	*1*	*K1*	*CO5*
10.	Fault Tree Analysis (FTA) and Event Tree Analysis (ETA) are examples of: (a) Quality control methods (b) Risk analysis techniques (c) Maintenance scheduling tools (d) Statistical sampling methods	*1*	*K1*	*CO6*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Write a short note on availability.	2	K1	CO1
12.	Define design life.	2	K1	CO1
13.	List the various functions of data analysis.	2	K1	CO2
14.	Define "failure in time".	2	K1	CO2
15.	List the various series and parallel components.	2	K1	CO3
16.	Discuss the various applications of dependence diagram.	2	K2	CO3
17.	Express a short note on impact of ALT.	2	K2	CO4
18.	Discuss the factors that cause failure in general.	2	K2	CO4
19.	What are the different types of risk measurement?	2	K1	CO5
20.	Write a short note on risk assessment.	2	K1	CO5
21.	What do you mean by cascading failure?	2	K2	CO5
22.	Define first aid.	2	K1	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Classify the various characteristics and functions of a bath tub curve.	11	K2	CO1
		OR			
	b)	Explain in detail about the concurrent techniques used in reliability for monitoring.	11	K2	CO1
24.	a)	Analyze empirical and theoretical probability in functional distributions.	11	K4	CO2
		OR			
	b)	Distinguish briefly about the importance of theoretical probability used in empirical methods.	11	K4	CO2
25.	a)	Evaluate the series and parallel systems used in sampling and probability estimation of failure during production control.	11	K5	CO3
		OR			
	b)	Evaluate the fault tree analysis using CNC lathe and milling operation.	11	K5	CO3
26.	a)	Assess and brief about the importance of software reliability test.	11	K3	CO4
		OR			
	b)	Experiment and briefly discuss the parameters and functions of probability ratio test.	11	K3	CO4
27.	a)	Explain the impact of safety management in industries	11	K2	CO5
		OR			
	b)	Explain the down time analysis techniques for risk management.	11	K2	CO5
28.	a)	A data sample is taken from a number of pieces of equipment operating in the field. Eight times-to-failure were recorded. These data in rank order are 215, 44.2, 71.2, 87.1, 105.4, 142.1, 162.1, 180.1 and 197.1 hr. Fit a Weibull distribution and solve for the shape parameter *f3* and the scale parameter α. Estimate the reliability for a similar piece of equipment for a mission of 100 hr.	11	K3	CO3
		OR			
	b)	Identify and assess the probabilistic risk assessment programme and its effect on reliability.	11	K3	CO3