Ministry of Higher Education & Scientific Research
Salahaddin University – Erbil - College of Administration & Economics
Department: Statistics & information
Stage: Three - Second Semester (2022-2023)
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Question Bank: (Reliability)

$Q_1/$ If (3000) items are put under the test, and if $Z(t) = 2 * 10^{-4}$, find:

1) Reliability for 300 hours.
2) $N_s(t)$ for 300 hours.
3) $N_f(t)$ for 300 hours.

$Q_2/$ Prove that: if $T \sim exp(\lambda) \rightarrow Z(t)$ *is constant*

$Q_3/$ Five components having reliabilities of (0.73, 0.85, 0.56, 0.91, and 0.62) are connected in parallel. What is the system reliability and system unreliability?

$Q_4/$ Define:

a) Probability of Failure (Failure Density function)
b) Qualitative Definition of reliability
c) Hazard function
d) Mean time between failure (MTBF)
e) Reliability of System

$Q_5/$ The failure rate of a machine electronic is (0.002) failures per hour, and its times to failure are defined by the following function:

$$f(t) = 0.002\, e^{-(0.002)t} \quad , \; for \quad t \geq 0$$

Calculate: 1) F(t) for 200 hours.
2) R(t) for 200 hours.
3) MTTF.

$Q_6/$ What are The type of connections in System?

$Q_7/$ Assume two units are connected in series and failure rates are λ_1 and λ_2 respectively find:

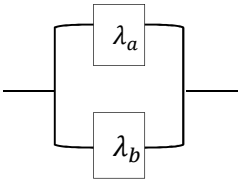
1) Reliability of the system.
2) Failure rate.
3) $f_{ss}(t)$.
4) MTBF.

Q_8/ Prove that: $E(t) = \int_0^\infty R(t)\,dt$, (by one side).

Q_9/ If λ=0.01 parameter of exponential distribution and R(t)=0.90,
Find: t [the number of hours as a system operated]

Q_{10}/ /What it means to say R(t)=0.90 ?

Q_{11}/ calculate the reliability and MTBF of the system show in figure



Q_{12}/ prove that: $E(t) = \int_0^\infty R(t)\,dt$

Q_{13}/ If $Z(t) = 3 * 10^{-5}$ find:

1) R(t) for 100 hours.
2) What is the reliability equal MTTF?

Q_{14}/ Assume that a system is composed of five independent and identical subsystems in series.
The constant failure rate of each subsystem is (0.0025) failures per hour.
Calculate the reliability of the system for a 50-hour mission and the system mean time to failure.

Q_{15}/ Show that: $R(t) = e^{-\int_0^t Z(s)ds}$

Q_{16}/ If the Reliability for (100h) equal to (0.99) find the failure rate.

Q_{17}/ Consider an electronic circuit 4-unit connected in series and each item of the above has exponential failure rate.

$\lambda_1 = 4 * 10^{-5}$ $\lambda_3 = 2 * 10^{-5}$
$\lambda_2 = 2 * 10^{-5}$ $\lambda_4 = 2 * 10^{-5}$

Find: 1) R_{ss} (t)
2) Zss(t)
3) R_{ss} (t=10) , reliability for (10) hours
4) $MTBF_{ss}$

Q_{18}/ Assume two units connected in parallel and have constant failure rates λ_1 and λ_2 respectively find:
1. $R_{ps(t)}$ 2. MTBFps