

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF MECHANICAL AND CHEMICAL ENGINEERING

Mid-Semester Examination

Summer Semester, A.Y. 2021-2022

Course No. MCE 6229

Time : 1½ hours

Course Title: Reliability Engineering and System Safety

Full Marks : 75

There are 3 (THREE) Questions. Answer all of them.

Marks in the Margin indicate the full marks.

1. a) Establish the relevance of reliability engineering in the design and manufacturing of certain products with an example. 5
 b) How would you distinguish between reliability, quality, durability, and availability? 5
 c) Enumerate the responsibilities of a reliability engineer. 5
 d) Briefly explain a reliability program for a manufacturing company. 5
 e) State the common tasks and techniques used in reliability engineering. 5
2. a) Distinguish between discrete and continuous probability distributions by mentioning their mass or density functions and finding the expected means and variances. Is it possible to convert a discrete variable into continuous variable? How? Give diagrams on each case. 10
 b) The failure distribution function in terms of time is defined by $f(t) = \frac{3t^2}{10^9}$, where symbols stand for their usual meanings. Determine the following: 15
 i. $R(t)$ after 100 hours of its use.
 ii. Probability of failure within a 100-hour of the warranty period.
 iii. The hazard rate function.
 iv. MTTF and variance.
 v. The median time to failure.
 vi. Find the designed life for a reliability of 0.98.
3. a) During its useful life of a component, the probability density function for exponential probability distribution is $f(t) = \lambda e^{-\lambda t}$. Determine the MTTF and variance of this function in terms of the appropriate parameter/s. Do the necessary integration. What will be the cumulative failure function? 10
 b) The block diagram of a system in the following figure reflects the combination of various subsystems in the equipment. Determine the reliability of the entire system. Show the step-by-step block diagrams and the relevant calculations. 15

