



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2007/2008
TRIMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN COMPUTER ENGINEERING
SCE 503: SYSTEMS RELIABILITY AND MAINTAINABILITY

DATE: Monday 11th August, 2008

TIME: 2.00 p.m. – 4.00 p.m.

INSTRUCTIONS

Answer question ONE and any other TWO questions.

- Q1. (a) (i) Explain why reliability is important in system design.
(ii) Describe what are the quantitative measures of reliability.
(b) Define the following terms:
(i) Operational availability
(ii) Inherent availability
(iii) System effectiveness
(c) A system consists of three subsystems in parallel. The individual subsystem reliabilities are as follows:
Subsystem A = 0.98
Subsystem B = 0.85
Subsystem C = 0.88
Determine the overall system reliability.
(d) (i) Explain why maintainability is important in system design.
(ii) Describe how the maintenance requirements can be determined.
(e) Given the following data, calculate the achieved availability,
(i) $\overline{Mct} = 0.5 \text{ hours}$
(ii) $MTBM_{\mu}$
(iii) $\overline{Mpt} = 2.0 \text{ hours}$
(iv) $MTB_s = 1000 \text{ hours}$
- Q2. (a) Describe the system requirements for a system being developed in response to fulfill some anticipated function.
(b) Explain how the reliability of a system depends on the reliability of its component parts selection and application.
(c) Describe the stress-strength characteristics and explain the steps which should be accomplished for such an analysis to be undertaken.
- Q3. (a) Describe the quantitative measures of maintainability.
(b) Corrective maintenance task times were observed as given in Table Q3.
(i) Determine the range of observations
(ii)

- (iii) Assuming 7 classes with a class interval of 4, plot the data, construct a curve and determine the type of distribution indicated by the curve.
- (iv) Calculate the mean repair time
- (v) Calculate the standard deviation of the sample data.

Task time (min)	Frequency	Task time (min)	Frequency
35	2	25	12
17	6	19	10
12	2	21	12
15	4	23	13
37	1	29	8
27	10	13	3
33	3	9	1
31	6	-	-

Table Q3

- Q4. (a) Describe the methods used in maintainability analysis that can be effectively used in support of objectives.
- (b) (i) Describe what is meant by maintainability allocation.
(ii) Explain the criteria used in the selection of personnel for the demonstration of maintenance tasks.
- (c) Explain what is meant by repair versus discard analysis.
- Q5. (a) Describe the steps used for conducting failure mode, effects and critically analysis (FMECA).
- (b) Describe the advantages of reliability testing.
- (c) Describe how reliability can have impact on maintainability, human factors, supportability and cost.

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