Note: That the final for 2006 is the same as 2000

Université d'Ottawa · University of Ottawa

Faculté de génie
Génie mécanique

Faculty of Engineering
Mechanical Engineering

MCG 4329

RELIABILITY AND MAINTAINABILITY IN ENGINEERING DESIGN

Final Examination — Time: 3 hours
December 20, 2004
Professor B. Dhillon — Page 1 of 2

No notes, books, or calculators permitted. Candidates should answer ALL questions.

		MARKS
1.	Assume that three independent diodes (i.e. three state devices) form a parallel configuration. Develop equations for the configuration reliability, open-mode failure probability, and short-mode failure probability.	12
2.	A system has four independent and non-identical active units. At least two of the four units must function normally for the system's successful operation. Develop expressions for the system reliability and mean time to failure if its unit failure times are exponentially distributed.	12
3.	Prove, using the **decomposition method**, that a five unit bridge network's reliability, R_b, is given by $R_b = 2R^2 + 2R^3 - 5R^4 + 2R^5$ where R is the unit reliability. State any assumption associated with your derivations.	12

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4. Prove that the mean time to failure ($MTTF_s$) of a system is given by 12

$$MTTF_s = (MTTF_u) \sum_{k=1}^{M} \frac{1}{k}$$

where $MTTF_u$ is the mean time to failure of a unit with exponentially distributed failure times

M is the total number of units in the system

State any assumption associated with your derivations.

5. (a) List and discuss at least five types of human error. Define a human error. 6

(b) Describe the following: 6

1. A three-state device
2. Infant mortality region of the bathtub hazard rate curve
3. Weibull distribution
4. Standby system
5. AND gate
6. Constant failure rate

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