



# Université d'Ottawa • University of Ottawa

Faculté de génie  
Génie mécanique

Faculty of Engineering  
Mechanical Engineering

MCG 4329

## RELIABILITY AND MAINTAINABILITY IN ENGINEERING DESIGN

Mid-Term Examination  
October 30, 2002  
Professor B. Dhillon

Time: 1 hour

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No notes or books permitted. Calculators are **not** allowed. Candidates should answer **all three** questions.

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- |  | MARKS |
|--|-------|
| 1. A system has 4 independent and identical active units. At least 2 of the four units must function normally for the system's success. Develop an expression for the system mean time to failure if its unit failure times are exponentially distributed. | 10    |
| 2. Develop delta to star equivalent reliability relationships.   | 10    |
| 3. <u>Write down three distinct approaches</u> for obtaining mean time to failure of a system. Develop an expression for a <b>m</b> independent unit series system hazard rate when each of its unit's failure times are exponentially distributed.        | 10    |

Parallel  $\Rightarrow R_P = 1 - \prod (r_i)$   
series  $\Rightarrow OR gate$