MS Exam Information: Mathematics

The MS Written Comprehensive Exam graduate question is based on ECE109 (Engineering Probability and Statistics) and undergraduate level engineering mathematics (Math 20 ABCDEF), including vector analysis, calculus, determinants and matrices, complex variables and differential equations. Other material on Fourier and Laplace transforms will be covered in the "Systems" part of the exam that covers ECE 45 and ECE 101. The math portion of the exam will consist of three questions. A passing grade is at least 50% for two out of the three parts. **The guidelines below refer to the possible exam questions.**

The material can be found in the following textbooks:

-Jon Rogawski, *Multivariable Calculus*, W. H. Freeman & Co., 2008. (UCSD Math 20C)
-William E. Boyce & Richard C. DiPrima, *Elementary Differential Equations,* John Wiley & Sons, Inc. 2009. (UCSD Math 20D)
-Jerrold E. Marsden and Anthony J. Tromba, *Vector Calculus*, 5th edition, W. H. Freeman & Co., 2003. (UCSD Math 20E)
-David C. Lay, *Linear Algebra and its applications*, 3rd edition, Addison-Wesley, 2002. (UCSD Math 20F)
-Sheldon Ross, *A First Course in Probability*, 7th Edition, Prentice-Hall, 2001 (UCSD ECE109).

Specific topics that will form the basis of the exam questions

Vectors and vector operations; derivation and integration of vector valued functions of one variable; partial derivatives and integration of functions of several variables.
Complex numbers; real and imaginary parts; modulus, argument; addition and multiplication.
Gradient, divergence, and curl of a function of several variables, Taylor's theorem, line integrals, volume and surface integrals; major theorems of vector calculus: Green's theorem, Stokes' theorem, and the Divergence theorem.
Ordinary differential equations: exact, separable, and linear; constant coefficient ODEs; series solutions; Laplace transforms for initial values problems.
Matrix algebra, Gaussian elimination, determinants, linear independence, bases of Euclidean spaces; eigenvalues and eigenvectors, diagonalization of symmetric matrices.
Random variables, densities, expected values, characteristic functions, transformation of random variables, central limit theorem, marginal and conditional distributions.

Math Exam Content:

1) Calculus including vector calculus and differential equations. (Math 20A, 20B, 20C, 20D and 20E)
2) Discrete math including linear algebra (20F)
3) Probability (ECE 109)

A passing grade is at least 50% for two out of the three parts.

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