MME Qualifying Exam Guidelines

Ph.D. Qualifying-Process Written-Examinations in Physicochemical Processing of Materials

The first component (general exam) – two individual three-hour duration examinations consisting of questions in each of the following (two) areas:

(1-1) Thermodynamics and Phase Equilibria in Materials Processing Systems
(1-2) Rate Phenomena in Materials Processing Systems

The second component (specific exam) of four-hours duration will consist of questions on one of the nine areas, listed below. The candidate indicates the selection in the completed Letter of Intent-and-Commitment form submitted to the Chair of the Graduate Affairs Committee. Demonstration of a high degree of mastery in the subject matter is necessary in order to be successful in the specific examination. Overall, an understanding of fundamental concepts, as well as the application of these to engineering problems, will be required to pass both components.

(2-1) Applied Surface Chemistry
(2-2) Aqueous and Electrochemical Processing
(2-3) Coating Processes
(2-4) Thermo-chemical processing
(2-5) Extraction Metallurgical Processing Systems
(2-6) Iron-and-Steelmaking Processing Systems
(2-7) Process Modeling
(2-8) Process Instrumentation-and-Control Systems
(2-9) High Temperature Oxidation/Corrosion Systems
Ph.D. Qualifying-Process Written-Examinations in Physical and Mechanical Metallurgy

Candidates sitting for the Qualifying-Process Written-Examinations in Physical and Mechanical Metallurgy will be expected to demonstrate: i) a broad knowledge of the entire field, and ii) a deeper understanding of the subject matter in their field of specialization.

The written exam consists of two components: a set of general exam questions and a set of specific exam questions. These questions can be answered in any order during two three-hour-duration sessions.

The first component (general exam) will consist of questions in the following areas:
- Thermodynamics
- Kinetics
- Microstructural Development
- Crystal Structure and Structure Analysis
- Phase Equilibria
- Mechanical Behavior
- Engineering Alloys

The candidate must answer 6 out of the 8 general exam questions provided.

The second component consists of four questions, and the candidate must select two questions to answer. The questions are in the areas of Thermodynamics and Kinetics of Phase Transformations and Mechanical Behavior of Materials. Demonstration of a high degree of mastery in the subject matter is necessary in order to be successful in the specific component of the examination.

The scores from the eight questions answered by the candidate are averaged to determine the written exam grade. Overall, an understanding of fundamental concepts, as well as the application of these to engineering problems, will be required to pass the exam.
Ph.D. Qualifying-Process Written-Examinations in Ceramic Engineering

Candidates sitting for the Qualifying-Process Written-Examinations in Ceramic Engineering will be expected to demonstrate a broad knowledge of the entire field. The examination topics are divided into seven sections listed below:

(1) Thermodynamics and Phase Equilibria
(2) Crystal and Glass Chemistry and Structure
(3) Ceramics Processing
(4) Mechanical Properties (including Composites)
(5) Electronic Properties (Conductivity, Dielectric and Magnetic)
(6) Optical properties
(7) Thermal Properties

The first component (general exam) – two three-hour-duration sessions – will consist of questions on topics (1), (2) and (3). The second component of four-hours duration will consist of questions on topic (4) and one of the remaining three topics – ( (5) or (6) or (7) ). The candidate indicates the selection in the completed Letter of Intent-and-Commitment form submitted to the Chair of the Graduate Affairs Committee. Demonstration of a high degree of mastery in the subject matter is necessary in order to be successful on the selected–topic questions of the second-component examination. Overall, an understanding of fundamental concepts, as well as the application of these to engineering problems, will be required to pass both components.