Dr B R Ambedkar University Delhi (AUD)

Scheme of Entrance Exam

MPhil programme in Mathematics

PhD programme in Mathematics

Candidates applying only for the MPhil programme in Mathematics have to take Exam I only.

Candidates applying for the PhD programme in Mathematics have to take both Exams I and II.

The level of questions in both exams will be based broadly on a Master's level curriculum in Mathematics. For more details see the relevant section on Syllabus on the AUD website.

Exam I: Common Entrance Test for MPhil and PhD programme

Duration: 3 hours

The Exam I question paper will have two parts:

Part A: Objective Questions

In the objective part there will be four choices for each question out of which only one option will be correct.

Part B: Subjective Question

In this part a candidate has to answer 4 questions. One question each has to be attempted compulsorily from Algebra and Analysis and remaining two questions from other fields.

Exam II: Only for PhD programme

Duration: 90 minutes

Questions for this section will be exploratory in nature drawn from the areas of research in which supervision will be offered. The level of questions will require a thorough knowledge of a Master's level curriculum in Mathematics. Candidate will be expected to attempt two questions out of four.

Sample Questions:

Exam I:

Part A (Objective)

1. The polynomial $p(x) = 2x + 1$ in $\mathbb{Z}_4[x]$
   a. has multiplicative inverse in $\mathbb{Z}_4[x]$.
   b. does not have multiplicative inverse in $\mathbb{Z}_4[x]$.
   c. has a zero in $\mathbb{Z}_4$.
   d. has more than one zeros in $\mathbb{Z}_4$.
2. Let (X, τ) be a topological space. Then
   a. every Cauchy sequence in X is convergent if X is a Hausdorff space.
   b. every sequence in X has a unique limit if X is a Hausdorff space.
   c. X is Hausdorff if $X = \{a, b, c\}$ and $\tau = \{\phi, X, \{b\}, \{a, b\}, \{b, c\}\}$.
   d. every finite subset of X is closed if X is a Hausdorff space.
3. $y_1 = x^m$ and $y_2 = x^n$, where m and n are constants, are the two solutions of a second order differential equation with constant coefficients. What is the condition under which $y = c_1y_1 + c_2y_2$ is the general solution of the equation?
   a. $m \neq n$.
   b. $m = n$.
   c. $m = -n$.
   d. $m + n = 1$ only.
4. Find the unit digit of 3^{100}
   a. 1.
   b. 2.
   c. 3.
   d. 5.

Part B (Subjective)

1. If $f(z) = u + iv$ is an analytic function on a complex plane $\mathbb{C}$ with $u = e^x cos(y)$. Find (z) ?
2. Let F be a field and let $f(x)$ be a polynomial in $F[x]$ that is reducible over F. Prove that $\langle f(x) \rangle$ is not a prime ideal in $F[x]$. What can you say about the maximality of $\langle f(x) \rangle$?