

Oral Exam Questions

1 Representation Theory/ Combinatorics

Question 1 (Kirillov): Describe the Clifford Group of order n and its relationship to finding tangent vector fields on S^N . Discuss the representations of $Cl(n)$, and how they relate to representations of the corresponding Clifford Algebra. In the course of talking about the major topics involved, I had to work out small examples completely ($Cl(1)$ and $Cl(2)$) and discuss their relationships to tangent fields on S^1 and S^3 respectively. I was then asked a few questions about what happens in general and about some of the theory behind the representations. APPROX TIME: 1 Hour

Question 2 (Ward): Define the autocorrelation polynomial $S_w(z)$ of a word w over a finite alphabet \mathcal{A} of order n . How is the autocorrelation polynomial used to determine how many words of a given length contain w as a subword and how many do not? If \mathcal{A} has a probability distribution on the letters, define the weighted autocorrelation polynomial $\widehat{S}_w(z)$. For a given k , find an expression for $\sum_{|w|=k} \widehat{S}_w(z)$. APPROX TIME: $\frac{1}{2}$ Hour

Question 3 (Okikiolu): Define the Unitary group $U(n)$ and determine its maximal torus $\Delta U(n)$. How does one obtain the Weyl group of $U(n)$ from knowing this maximal torus? What is the Dynkin diagram associated to the Weyl group? How are the generators and relations of the Weyl Group related to the Lie Algebra of $\Delta U(n)$ (i.e. as reflections in hyperplanes, roots of the Weyl Group, etc). APPROX TIME: $\frac{1}{2}$ Hour

Question 4 (All three): Would you leave the room? APPROX TIME: 10 seconds

Question 5 (All three): Would you come back to the room so we can give you the finished paperwork? APPROX TIME: 30 seconds

Questions 6 through 193 (other students): How did it go?, Did you pass?, etc. APPROX TIME: Next several days