

Name	Ent. No.
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Important: Keep your answer within the box. Anything written outside the box will be treated as rough work. Do your rough work on the free space on the flip side of this sheet.

Q. $G = (V, E)$ is a simple, undirected graph with no self-loops. G has minimum degree δ and maximum degree Δ . A k -colouring of G is a function $f : V \rightarrow [k]$ such that $(u, v) \in E \Rightarrow f(u) \neq f(v)$.

Given k , we choose a random mapping $\phi : V \rightarrow [k]$ as follows: $\phi(u)$ is chosen uniformly at random from $[k]$ and the collection $\{\phi(u) : u \in V\}$ is mutually independent. What is the probability that ϕ is a k -colouring of G ? What is the minimum value of k required to ensure that the probability of ϕ being a k -colouring is at least $1 - 1/n$?