

## My experience at TIFR CAM interview

by Moulindu Sen - Tuesday, March 29, 2016

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Being inspired by [some of my predecessors in the internet](#), who have written about their [experiences at the interview board](#), I had decided to do the same when I first came to know about my selection . Even though at the end of the day my interview was worse than what I had thought still I would like to share my experience as I think the questions asked were pretty good and thus this post might help other students who aspire to be at TIFR someday.

My interview was scheduled on 16th of March, 2016. We (me and my mother) were supposed to catch a flight at 6.20 a.m on 15th. This was my first flight experience and I thoroughly enjoyed the take off . However after the plane attained a certain altitude and became stable the only thing interesting were the air hostesses.

The next day we set out for TIFR-CAM. We reached there at around 8.30 am. We had our breakfast at the canteen which was remarkably cheap. I had three dosas for twenty bucks. The form verification started from 9.00 a.m. The process was very slow and tedious and the interviews lasted for around 30 to 50 minutes. My name being there at the 9th position made me feel miserable. I somehow managed to keep my eyes open till 3 p.m around when my turn for the interview came.

I entered the room and saw the panel which unexpectedly didn't seem formidable to me. I happen to be unaware of the names of the panelists. So I would refer to the interviewers as "P" and myself as "I".

P: So you are Moulindu Sen?

I: Yes, I am Moulindu.

P: So tell us something about you. You are in BSc 2nd year now, right?

I: No, I am in BSc 3rd year now.

P: But you haven't cleared some of the papers in 2nd year, have you?

I: Yes, I had failed in an ancillary paper in 3rd sem and two honours papers in the 4th sem. I cleared the ancillary in the 5th sem and will get to clear the honours papers in the 6th sem.

P: Ok, so what are the papers that you failed in ?

I: I failed in numerical analysis and LPP.

( The whole conversation was so awkward for me)

P: (jokingly) have you failed in any other papers?

I: Yes, in the first sem I got an arrear in Differential Equations which I cleared eventually.

P: (laughing) My god!! You had so many arrears. And We all breathe differential equations here. We all

do differential equations.

I: I would love to know about differential equations but these three years I mainly concentrated on Pure Mathematics.

P: Then you should have applied for Mumbai.

I: (with a smile) I did , but I couldn't make it.

P: So you haven't failed in analysis ever ? right?

I: No, I haven't.

P: Ok, so what are you comfortable with ?

I: I would prefer topology.

P: How much have you done in topology?

I: very elementary point-set topology.

P: Ok, so there is the board and here is your marker .

(suddenly I felt a rush of blood into my cardiac chambers)

P: So which one is true?  $f$  is a continuous function, then the image of a compact space is compact or the pre-image of a compact space is compact?

I: Sir, the image of a compact space under a continuous function is compact.

P: What about the second one?

I: sir, It may not hold.

P: Give an example where it doesn't hold.

I: Suppose  $f$  is the identity function from  $\mathbb{R}$  with discrete topology to  $\mathbb{R}$  with usual topology. Then we take the set  $[0,1]$  in  $\mathbb{R}$  with usual topology. Its pre-image will be  $[0,1]$  which is not compact in  $\mathbb{R}$  with discrete topology.

P: Can you construct a dis-continuous function from a  $\mathbb{R}$  with discrete topology to  $\mathbb{R}$  with any other topology?

(I failed to understand the question )

(I waited for a while)

P:What is a discrete topology?

I: A topology where every singleton set is open as well as closed.

I:Sir, I didn't get your question.

P:(repeats the question which seemed to be in much more clearer terms to me)

I:(getting the question) Oh! no sir, we cannot since in discrete topology every subset is open.

P: Ok, now suppose there is an topology on  $\mathbb{R}$ , say  $\mathbb{R}_t$  . I say , a function  $f(x)=e^x$  from  $\mathbb{R}_t$  to  $\mathbb{R}$  with usual topology is continuous. Is it necessary that  $\mathbb{R}_t$  is Hausdorff?

I: (puzzled)....

P: Take two points  $x_1, x_2$  from  $R_t$  with  $x_1 < x_2$ . Now write the images.

I: Writes and shows that  $R_t$  Hausdorff.

P: Write the neighborhoods of  $e^{x_1}$  and  $e^{x_2}$  explicitly.

I: ( I write them down with a little help for one of the professors)

P: So what will be the neighborhoods of  $x_1$  and  $x_2$ ?

I: (I write them down)

P: So what do you infer from this?

I: (puzzled)..

P: Ok, that's for you to think .....

(Later, after the interview, I realized the inference that is the pre image of a Hausdorff space under a continuous function is Hausdorff)

P: Ok, suppose  $X$  is a finite set with any topology and  $f$  is a continuous bijective map from  $X$  to  $X$ . Is  $f$  homeomorphic?

I: (puzzled once again)...

P: What do you mean by homeomorphism?

I: Sir, two sets are homeomorphic by that we mean that the topological structures of the two sets are the same.

P: No, what do you need to show in order to show that it is a homeomorphism?

I: Sir, we would show that  $f^{-1}$  is continuous.

P: Do you know about symmetric groups?

I: yes sir

P: What are the properties of  $S_n$ ?

I: ... each element is of finite order..

P: Yes, So what is  $f^{-1}$ ?

I: (realizing the  $f$  belongs to  $S(X)$ )  $f^{n-1}$  where  $n$  is the order of  $f$ .

P: ok so, is  $f^{n-1}$  continuous?

I: yes sir, since the composition of continuous functions is continuous.

P: and that's what you need to show here, right?

I: yes yes, I get it (admiring the beauty of the problem).

P: Ok, ....now...consider the space  $C[0,1]$  i.e the set of continuous functions on  $[0,1]$  under the sup metric....is it complete?

I: (thinking for a while)...yes it is. Because if  $\{f_n\}$  is a Cauchy sequence in  $C[0,1]$ , then for every arbitrary  $\epsilon > 0$  we will get a  $K$  such that  $d(f_n, f_m) < \epsilon$  for all  $n, m > K$ . This

satisfies the conditions for uniform convergence of  $\{f_n\}$ ...now the limit function is also continuous on  $[0,1]$  as it is uniformly convergent.

P:Ok, now is  $C_1[0,1]$  cauchy?

I:(I had no idea about how to approach this problem...later, after the interview I came out with an example of a Cauchy sequence in  $C_1[0,1]$  whose limit function is not in  $C_1[0,1]$  )

P: Ok, you think about it....You may go now. (smiling) Good luck to you.

Hearing the last few words made me certain that I am not going to make it anyhow. However the whole experience of coming to Bangalore with my mother and facing an interview for the first time in my life was very enriching. My interview lasted for about 45 minutes and I am happy to have come in such close terms with such prolific mathematicians of our country, some of them being [Bhatnagar awardees](#). Considering my poor academic records and pathetic mathematical aptitude I don't think that I'll be able to stick with the academic sphere for long. But still I would like to wish all the very best to the other aspirants who want to be in the academic sphere and do research work.

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