

COL703: Logic for Computer Science

Sat 11 Sep 2021

Quiz 3

20+5+5 minutes

Max marks 10

Instructions:

1. Download the paper.
2. Write your name and entry number in the designated space on top and *do not forget to sign the honour statement below*.
3. Answer the question(s) in the appropriate space provided starting from this page.
4. Scan the paper with your completed answer.
5. Upload it on Gradescope 2001-COL703 page within the given time. *Make sure the first page with your name, entry no and signature is also the first page of your uploaded file*
6. Late submissions (within 2 minutes of submission deadline) on the portal will attract a penalty of 2 marks out of 10.
7. Email submissions after the closing of the portal will not be evaluated (You get a 0).
8. Uploads without the first page details (including signature) will be awarded 0 marks.

I abide by the Honour code that I have signed on my admission to IIT Delhi. I have neither given any help to anybody nor received any help from anybody in solving the question(s) in this paper.

Signature:**Date:**

5+3+1+1=10 marks

Definition 0.1 Two formulae $\phi, \psi \in \mathcal{P}_0$ are said to be **equisatisfiable** provided ϕ is satisfiable if and only if ψ is satisfiable.

Let $=_{SAT}$ denote the equisatisfiability relation on \mathcal{P}_0 .

1. Prove that equisatisfiability is an equivalence relation.
2. Prove that if $\phi \Leftrightarrow \psi$ then $\phi =_{SAT} \psi$.
3. Give an example of formulae ϕ and ψ such that $\phi =_{SAT} \psi$ but $\phi \not\Leftrightarrow \psi$ and justify your choice.
4. Give an example of formulae ϕ and ψ such that $\phi \Rightarrow \psi$ but $\phi \neq_{SAT} \psi$ and justify your choice.