COL703: Logic for Computer Science

Sat 30 Oct 2021 **Quiz 6** 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:**

[4+3+3=10 marks]

Let p and q be binary predicates. Consider the formula

$$\phi \equiv \forall x \exists y[p(x,y)] \vee \neg \exists x \forall y[q(x,y)]$$

1. Derive at least two distinct skolemizations ϕ_1 and ϕ_2 such that $\phi \not\Leftrightarrow \phi_1 \not\Leftrightarrow \phi_2 \not\Leftrightarrow \phi$.
2. Prove that $\phi_1 \Rightarrow \phi$ and $\phi_2 \Rightarrow \phi$.
3. Show that $\phi \not\Rightarrow \phi_1$ and $\phi \not\Rightarrow \phi_2$.