

UNIVERSITY, ISLAMABAD
Department of Computer Science
Mid Term Examination, FALL 2023

Class: BCS, BSE, BAI, BDS, BCT

Semester: 1st

Subject: CSC102 – Discrete Structures

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Date: 10-11-23

Time Allowed: 80 Minutes

Marks: 25

Instructions: All Questions are compulsory.

CLO1 - Apply symbolic propositional and predicate logic to determine the most effective solutions of a given problem. [10]

1) Suppose that Smartphone A has 2GB RAM and 32 GB ROM, and the resolution of its camera is 8 MP; Smartphone B has 4GB RAM and 64 GB ROM, and the resolution of its camera is 4 MP; and Smartphone C has 2GB RAM and 32 GB ROM, and the resolution of its camera is 5 MP. Write the following sentences in propositional logic statement and determine the truth value of each of these propositions.

[4]

- Smartphone C has more ROM or a higher resolution camera than Smartphone B.
- Smartphone B has more RAM, more ROM, and a higher resolution camera than Smartphone A.
- If Smartphone B has more RAM and more ROM than Smartphone C, then it also has a higher resolution camera.
- Smartphone A has more RAM than Smartphone B if and only if Smartphone B has more RAM than Smartphone A.

2) Translate each of these statements into logical expressions using predicates, quantifiers, and logical connectives. Consider that the domain consists of all people in the World.

[3]

- Someone in your class can speak Hindi.
- There is a person in your class who was not born in California.
- A student in your class has been in a movie.

3) Let $L(x, y)$ be the statement " x loves y ," where the domain for both x and y consists of all people in the World. Use quantifiers to express each of these statements. [3]

- Everybody loves Jerry.
- There is somebody whom everybody loves.
- Nobody loves everybody.

O2 - Apply formal logic proofs and reasoning to construct a sound argument. [5]

For the following collections of premises, what relevant conclusion or conclusions can be drawn? Explain the rules of inference used to obtain each conclusion from the premises.

[3]

If I eat spicy foods, then I have strange dreams. I have strange dreams if there is thunder while I sleep. I did not have strange dreams.

- 5) For the following argument determine whether the argument is correct or incorrect and explain why. [2]

Convertible cars are fun to drive. Isaac's car is not a convertible. Therefore, Isaac's car is not fun to drive.

CLO3 - Solve a computing problem using a specific set, function, or relation model. [10]

- 6) 150 college freshmen were interviewed. 85 were registered for a math class. 70 were registered for an English class. 50 were registered for both math and English. Solve this problem using Venn diagram.

[4]

- How many signed up only for a Math class?
- How many signed up only for an English class?
- How many signed up for Math or an English class or both?
- How many signed up for neither Math nor English?

[2]

- 7) Determine whether the function $f(x) = x^2$ is a bijection from \mathbf{Z} to \mathbf{Z} .

- 8) Convert the following graphs into their respective relation ordered pairs. Calculate the union, intersection and difference (in any one order) of both graphs. [4]

