

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]

- a) Smartphone C has more ROM or a higher resolution camera than Smartphone B.
- b) Smartphone B has more RAM, more ROM, and a higher resolution camera than Smartphone A.
- c) If Smartphone B has more RAM and more ROM than Smartphone C, then it also has a higher resolution camera.
- d) 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]

- a) Someone in your class can speak Hindi.
- b) There is a person in your class who was not born in California.
- c) 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]

- a) Everybody loves Jerry.
- b) There is somebody whom everybody loves.
- c) 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 $\mathbb{Z}$ to $\mathbb{Z}$.

- 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]

