Softwarica College of IT & E-Commerce

ST4068CEM (Mathematics for Computer Science)

Coursework Brief [September 2022]

<table>
<tr><td>Module Title:
Mathematics For Computer Science</td><td>Ind/Group:
Individual</td><td>Cohort:
Sep. 2022</td><td>Module Code:
ST4068CEM</td></tr>
<tr><td colspan="3">Coursework Title:
Coursework</td><td>Handout Date:</td></tr>
<tr><td colspan="3">Lecturer:
Shanta Rayamajhi Basnet</td><td>Due Date:</td></tr>
<tr><td>Estimated Time (hrs.): [In Hours]
Word Limit:[ ]</td><td colspan="2">Coursework Type:
Assignment</td><td>% Of Module Mark:
33%</td></tr>
<tr><td colspan="4">Submission arrangement online via Softwarica’s Moodle:

File types and method of recording: Submission should be with one file.

Mark and Feedback date: TBD

Mark and Feedback method: Marks and Feedback file will be released on Softwarica’s Moodle.</td></tr>
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File types and method of recording:

Mark and Feedback date: 2 weeks after submission

Mark and Feedback method: Written feedback using Softwarica Moodle

Module Learning Outcomes Assessed:

Construct and communicate proofs using methods of propositional logic and induction.

Task and Mark distribution:

0-39	40-49	50-59	60-69	70-79	80+
Work mainly incomplete and /or weaknesses in most areas.	Most Elements completed; weaknesses outweigh strengths	Most Elements are strong, minor weaknesses	Strengths in all elements	Most work exceeds the standard expected	All work substantially exceeds the standard expected

Notes:

1. You are expected to use the CU Harvard referencing format. For support and advice on how this student can contact Centre for Academic Writing (CAW).

2. Please notify your registry course support team and module leader for disability support.

3. Any student requiring an extension or deferral should follow the university process as outlined here.

4. The University cannot take responsibility for any coursework lost or corrupted on disks, laptops or personal computer. Students should therefore regularly back-up any work and are advised to save it on the University system.

5. If there are technical or performance issues that prevent students submitting coursework through the online coursework submission system on the day of a coursework deadline, an appropriate extension to the coursework submission deadline will be agreed

Marking Rubric

GRADE	Problem Solving	Math Content	Math Communication	Presentation	Uses of Mathematical Terminology
First ≥ 70	Detailed response given with no mathematical errors when solving problems.	Demonstrate a clear knowledge and application of math skills.	Accurately communicates solutions to problems and concepts.	Solution is presented in an easy follow step by step model.	Mathematical terminology is presented and uses correctly.
Upper Second 60-69	Detailed responses given that shows understanding of the problem but final answer may not be correct when solving problems	Demonstrate a general knowledge and application of math skills.	Satisfactory communicates solutions to problems and concepts.	Solution is presented in logical manner.	Mathematical terminology correctly used.
Lower Second 50-59	Explanation or diagram unclear, final answer is not correct but response shows some understanding of the problem.	Demonstrate a limited knowledge and application of math skills.	Limited communication of solutions to problems and concepts.	Solution is presented in difficult way.	Mathematical terminology correctly used but some problem in presentation
Third 40-49	Little understanding of the problem is evidenced.	Demonstrate a little knowledge and application of math skills.	Little communication of solutions to problems and concepts.	Solution is difficult to follow at times.	Some mathematical terminology is presented but not correctly used.

Fail < 40	Miss key points and no appropriate supporting diagram provided. The response shows no understanding of the problem.	Demonstrate no knowledge and application of math skills.	Inaccurately communicates solutions to problems and concepts.	The readers is unable to follow the steps taken in the solution	No mathematical terminology is used or attempted.
Late submission	0	0	0	0	0

Section: A **[60 Marks]**

There are (FOUR) 4 questions in this section, attempt ALL questions.

Q.N.1

a.

i. Find the truth value of $\neg (p \wedge q) \Rightarrow r$ if p and r are false, and q is true.

(2 marks)

ii. What is the truth value if the brackets are removed?

(2 marks)

b.

Let *p* and *q* be the proposition

p: Swimming is allowed.

q: Sharks have been spotted near the shores

Express each of the following compound propositions as an English sentence.

(6 marks)

i. $p \wedge q$ **:**

ii. $\neg p \vee q$ **:**

iii. $p \rightarrow \neg q$ **:**

c. Write converse, inverse and contrapositive of "If today is my birthday, then I will get cake." (3 marks)

Q.N.2

a. We consider the problem of controlling a nuclear reactor. Given the atomic sentences "The operator presses the alarm", "the reactor is in danger of melting down", "The control process closes down the reactor", and "The core temperature is rising rapidly", represent the first by A, the second by B, the third by C and the last by D. Convert into English

i. $B \Rightarrow (A \vee C)$

ii. $A \vee \neg D$

iii. $(A \wedge B) \Rightarrow C$

iv. $(A \vee D) \Rightarrow (C \Leftrightarrow B)$

(8 marks)

b. Convert into symbolic form

i. If the operator presses the alarm and the core temperature is not rising rapidly then the control process does not close down the reactor.

ii. If the core temperature is rising rapidly then the reactor is in danger of melting down and the operator presses the alarm.

iii. If the core temperature is rising rapidly then the reactor is in danger of melting down or the operator presses the alarm.

(6 marks)

Q.N.3

a. Construct a truth table to establish the following compound propositions tautology, contradiction or contingency: $[(p \wedge q) \vee [\sim p \vee (p \wedge \sim q)]$

(5maks)

b. Prove the following statements are tautology

a. $[(p \wedge \neg q) \vee \neg p] \vee q$ (4 marks)

ii. $[p \vee (\neg p \wedge q)] \vee (\neg p \wedge \neg q)$ (4 marks)

Q.N. 4

a. Prove by the method of Mathematical Induction:

$1.2 + 2.3 + 3.4 \ldots\ldots + n(n+1) = \frac{n(n+1)(n+2)}{3}$

(5 marks)

b. Using the principle of mathematical induction, prove that $(n^2 + n)$ is even for all $n \in N$.

(7 marks)

c.

i. Give a Recursive formula for: 6, 12, 18, 24, 30……

(4 marks)

ii. Given a recursive sequence if $t_{n+1} = t_n + t_{n-1}$ Where

$t_0 = 1 \; and \; t_1 = 3 \; then \; find \; t_5$ (4 marks)

Section: B **[40 Marks]**

There are (THREE) 3 questions in this section, attempt ALL questions.

Q.N.1

a. State which rule of inference is used in the argument:

If it rains today, then we will not have a barbecue today. If we don't have a barbecue today, then we will have a barbecue tomorrow. Therefore, if it rains today, then we will have a barbecue tomorrow.

(5 marks)

b. Translate the following argument into propositional calculus and test for validity using truth table. "If Fred has access to file file.dat then it is encrypted. If file.dat is not encrypted, then it cannot be in a publically accessible directory. Therefore, Fred has access to file.dat and it is not in a publically accessible directory."

(5 marks)

c. Show that the hypothesis is valid: It is not sunny this afternoon and it is colder than yesterday. We will go swimming only if it is sunny. If we don't go swimming, then will take a canoe trip, if we take a canoe trip, then we will be home by sunset. Therefore, we will be home by sunset.

(6 marks)

Q.N.2

Let, Predicates:

J(x): x is judges

S(x): x is sober

D(x): x is defendants

H(x): x is honest.

L(x): x is lawyers.

I(x): x is innocents

P(x): x is plaintiffs

a. Express the following using the language of predicate calculus, where it is understood that the people being discussed is in the courtroom.

i. All judges are sober. (2 marks)

ii. All defendants are innocents. (2 marks)

iii. Some plaintiffs are lawyers (2 marks)

b. Express the following in normal English:

i. $\forall x \in C: J(x) \vee S(x)$ (2 marks)

ii. $\forall x \in C: H(x) \wedge L(x) \Rightarrow S(x)$ (2 marks)

c. Give the negation of each statement both in symbolic form and in natural English.

i. All judges are sober. (2 marks)

ii. There is a dishonest lawyer (2 mark)

Q.N.3

c. Construct the formal Proof to show that

i. $A, A \Rightarrow B, C \Rightarrow \neg B \vdash \neg C$ (5 marks)

ii. $P \vee Q, Q \Rightarrow \neg R, R \vdash P$ (5 marks)

The End