



UCSC

University of Colombo, Sri Lanka

University of Colombo School of Computing



**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY
(EXTERNAL)**

Academic Year 2025— 1st Year Examination — Semester 2

IT2106 — Mathematics for Computing I

Multiple Choice Question Paper
(2 Hours)

Important Instructions

- The duration of the paper is **2 Hours**.
- The medium of instructions and questions is English.
- This paper has **40 MCQ questions** on **8 pages**. Answer **all** questions.
- Each question will have **5 (five)** choices with **ONE OR MORE** correct answers.
- This paper consists of 100 marks and all the questions will carry equal marks.
- There will be a penalty for incorrect responses to discourage guessing.
- The mark given for a question will vary from -1 (All the incorrect choices are marked & no correct choices are marked) to +1 (All the correct choices are marked & no incorrect choices are marked). However, **the minimum mark per question would be zero**.
- Answers should be marked on the **special answer sheet** provided.
- Note that questions appear on both sides of the paper. If a page or part of a page is not printed, please inform the supervisor/invigilator immediately.
- Mark the correct choices on the question paper first and then transfer them to the given answer sheet which will be machine marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices.**
- Any electronic device capable of storing and retrieving text, including electronic dictionaries, smartwatches, and mobile phones, is not allowed.
- Calculators are **not** allowed.
- *All Rights Reserved*. This question paper can NOT be used without proper permission from the University of Colombo School of Computing.

- 1) Let $A = \{x \mid x \in \mathbb{R} \text{ and } x^2 - 3x + 2 = 0\}$ and $B = \{x \in \mathbb{R} \mid x^2 - 4x + 3 = 0\}$. What is $A \cap B$?

- | | | |
|-------------|-----------------|-------------|
| (a) $\{2\}$ | (b) $\{1,2\}$ | (c) $\{1\}$ |
| (d) $\{3\}$ | (e) $\{1,2,3\}$ | |

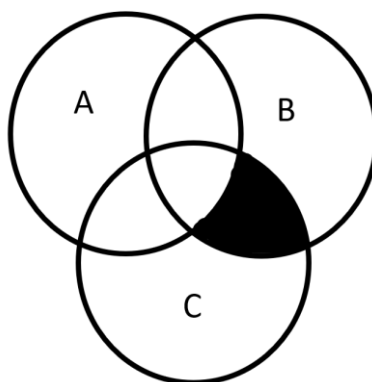
- 2) Let $A = \{0\} \cup \mathbb{N}$ and $B = \{0\} \cup \{-n \mid n \in \mathbb{N}\}$. $A \cup B$ is equal to

- | | | |
|------------------|---------------------|---------|
| (a) B | (b) $\mathbb{N}$ | (c) A |
| (d) $\mathbb{Z}$ | (e) $A \setminus B$ | |

- 3) Let A and B be any two non-empty sets. If A is a proper subset of B , which of the following(s) **must** be TRUE?

- | | | |
|-----------------------|--------------------|-------------------------------|
| (a) $B \subseteq A$ | (b) $A = B$ | (c) $A \cap B \neq \emptyset$ |
| (d) $A \cap B \neq B$ | (e) $A \cup B = A$ | |

- 4) Consider the following Venn diagram. Which of the following is(are) represented by the shaded region in the above Venn diagram?



- | | | |
|------------------------------|------------------------------|------------------------------|
| (a) $B \cup C$ | (b) $B \setminus (A \cup C)$ | (c) $(A \cap B) \setminus C$ |
| (d) $(B \cap C) \setminus A$ | (e) $(B \cap C) \cap A^c$ | |

- 5) Let X be a non-empty subset of the universal set U . Which of the following is(are) always correct?

- | | | |
|-----------------------------|-------------------|---------------------|
| (a) $\emptyset \subset X$ | (b) $X \subset X$ | (c) $X \subseteq X$ |
| (d) $\emptyset \subseteq X$ | (e) $U \subset X$ | |

- 6) Let A , B and C be three non-empty sets. Which of the following is(are) correct?

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|--|
| (a) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ |
| (b) $A \cup (B \cap C) = (A \cap B) \cup (A \cap C)$ |
| (c) $A \cup (B \cap C) = (B \cup A) \cap (C \cup A)$ |
| (d) $A \cup (B \cap C) = (B \cap A) \cup (C \cap A)$ |
| (e) $A \cup (B \cap C) = A \cap (B \cup C)$ |

7) Let p and q be two propositions. Which of the following propositions is(are) a **tautology**?

- (a) $(\sim p \vee q) \Leftrightarrow \sim(p \wedge \sim q)$
 (b) $(p \Rightarrow q) \Leftrightarrow (\sim p \wedge q)$
 (c) $(p \Rightarrow q) \Leftrightarrow \sim(p \wedge q)$
 (d) $(\sim p \wedge q) \Leftrightarrow \sim(p \wedge \sim q)$
 (e) $(\sim p \vee q) \Leftrightarrow (p \Rightarrow q)$

8) Which of the following propositions is(are) TRUE?

- (a) If $10 = 11$, then $3 + 3 = 7$.
 (b) If fish can walk on land, then $2 + 2 = 4$.
 (c) $5 > 6$ and 17 is a even number.
 (d) $5 > 6$ or 10 is an odd number.
 (e) n is an integer and n is divisible by both 8 and 12 if and only if n is divisible by 24.

9) Which of the following is(are) equal to $x^{\frac{2}{5}}$

- (a) $\left(x^{\frac{1}{10}}\right)^2$ (b) $\left(x^{\frac{1}{5}}\right)^{\frac{1}{2}}$ (c) $\left(x^{\frac{3}{5}}\right)^{\frac{2}{3}}$
 (d) $\sqrt[5]{x^2}$ (e) $\left(x^{\frac{1}{5}}\right)^2$

10) Evaluate $(4a^6b^4c^2)^{\frac{1}{4}}$ when $a = 2, b = 3, c = 9$.

- (a) 24 (b) 36 (c) 48
 (d) 144 (e) 1

11) $\frac{27^{\frac{1}{3}} \times 2^2}{125^{\frac{2}{3}}}$ is equal to

- (a) $\frac{36}{5}$ (b) $\frac{36}{25}$ (c) $\frac{12}{5}$
 (d) $\frac{12}{25}$ (e) $\frac{12}{125}$

12) Which of the following is/are a solution/s of $2\log_2(x + 1) = 1 + \log_2(x + 2)$.

- (a) $\sqrt{2}$ (b) 0 (c) $-\sqrt{3}$
 (d) $\sqrt{3}$ (e) $-\sqrt{2}$

- 13) A card is selected at random from a standard deck of 52 playing cards. What is the probability that the card is a King or a Queen?

(a) $\frac{1}{13}$	(b) $\frac{1}{6}$	(c) $\frac{2}{13}$
(d) $\frac{1}{4}$	(e) $\frac{3}{13}$	

- 14) Supplier A provides products with a defect rate of 4%, Supplier B has a defect rate of 6%, and Supplier C has a defect rate of 8%. A supplier is selected randomly, with all suppliers equally likely to be selected. What is the probability that a randomly chosen product is defective?

(a) 0.04	(b) 0.05	(c) 0.06
(d) 0.07	(e) 0.08	

- 15) The probability that a student borrows a book from the university library is 0.55. The probability that a student visits the library during a week is 0.80. The probability that a student borrows a book given that they visited the library is 0.65. What is the probability that a student both visits the library and borrows a book?

(a) 0.42	(b) 0.48	(c) 0.52
(d) 0.56	(e) 0.60	

- 16) A and B are two random independent events. It is known that $P(A) = 0.25$ and $P(A \cup B^c) = 0.925$. Which one of the following is the value of $P(B)$?

(a) 0.10	(b) 0.05	(c) 0.15
(d) 0.60	(e) 0.25	

- 17) If $P(A/B) = P(A)$ and $P(B/A) = P(B)$, then A and B are

(a) Mutually exclusive	(b) Dependent	(c) Equally likely
(d) Exhaustive	(e) Independent	

- 18) Two fair coins are tossed simultaneously. Given that at least one of the two coins shows a head, what is the probability that the other coin shows a tail?

(a) $\frac{1}{2}$	(b) $\frac{2}{3}$	(c) 1
(d) $\frac{1}{3}$	(e) $\frac{3}{4}$	

- 19) A pair of fair six-sided dice is thrown. Given that the first die shows a 5, what is the probability that the sum of the two dice is greater than 9?

(a) $\frac{1}{6}$	(b) $\frac{2}{3}$	(c) $\frac{5}{6}$
(d) $\frac{1}{2}$	(e) $\frac{1}{3}$	

- 20) Let the functions f and g be defined by $f(x) = 3x + 1$ and $g(x) = x^2 - 1$. Find the formula defining $g \circ f$.

(a) $3(x^2 - 1) + 1$	(b) $3x(3x + 2)$	(c) $9x^2 - 3$
(d) $3x^2 - 2$	(e) $9x - 3$	

- 21) Bag A contains 10 marbles of which 2 are red and 8 are black. Bag B contains 12 marbles of which 4 are red and 8 are black. A ball is drawn at random from each bag. What is the probability that at least one is red?

(a) $\frac{8}{15}$	(b) $\frac{1}{15}$	(c) $\frac{7}{15}$
(d) $\frac{1}{2}$	(e) $\frac{6}{22}$	

- 22) The probability that a foreign company will establish a branch in City A is 0.6, the probability that it will establish a branch in City B is 0.5, and the probability that it will establish a branch in either City A or City B or both is 0.9. What is the probability that the company will establish a branch in neither city?

(a) 0.05	(b) 0.15	(c) 0.10
(d) 0.25	(e) 0.35	

- 23) A box contains p red balls, q blue balls, and r green balls. Two balls are drawn at random with replacement. What is the probability (in terms of p, q, r) that both balls are blue?

(a) $\frac{q}{p+q+r}$	(b) $\frac{2q}{p+q+r}$	(c) $\frac{q^2}{(p+q+r)^2}$
(d) $\frac{q}{(p+q+r)^2}$	(e) $\frac{q}{p^2+q^2+r^2}$	

- 24) Let $\mathbf{p}$ and $\mathbf{q}$ be two propositions. Which of the following pairs of propositions are logically equivalent?

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|---|---|--|
| (a) $p \wedge (\sim p \vee q), q$ | (b) $p \Rightarrow q, \sim p \vee q$ | (c) $p \wedge (\sim p \vee q), p \wedge q$ |
| (d) $p \Leftrightarrow q, (p \Rightarrow q) \vee (q \Rightarrow p)$ | (e) $p \Leftrightarrow q, (\sim p \vee q) \vee (p \vee \sim q)$ | |

- 25) Let $\mathbf{p}$ be the statement “It is raining” and $\mathbf{q}$ be the statement “The ground is wet”. Which of the following represents the statement “It is not raining but the ground is wet”?

- | | | |
|---------------------|-----------------------|----------------|
| (a) $p \wedge q$ | (b) $\sim p \wedge q$ | (c) $p \vee q$ |
| (d) $\sim p \vee q$ | (e) $p \Rightarrow q$ | |

- 26) Consider the following truth table of the proposition λ with three propositional variables p, q and r .

p	q	r	λ
T	T	T	T
T	T	F	F
T	F	T	T
F	T	T	T
T	F	F	T
F	T	F	T
F	F	T	F
F	F	F	T

Which of the following could be λ ?

- | |
|---|
| (a) $(p \wedge q \Rightarrow p \vee q) \vee \sim r$ |
| (b) $(p \wedge q \wedge r) \vee (p \wedge \sim q \wedge r) \vee (\sim p \wedge q \wedge r) \vee (p \wedge \sim q \wedge \sim r) \vee (\sim p \wedge q \wedge \sim r) \vee (\sim p \wedge \sim q \wedge \sim r)$ |
| (c) $(p \wedge q \wedge \sim r)$ |
| (d) $(\sim p \vee \sim q \vee r) \wedge (p \vee q \vee \sim r)$ |
| (e) $(p \vee q \vee \sim r)$ |

- 27) Let function $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = 7x - 3$. Find f^{-1} .

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|--|
| (a) $D(f^{-1}) = \mathbb{R}, f^{-1}(x) = 7x+3$ |
| (b) $D(f^{-1}) = \mathbb{R}, f^{-1}(x) = \frac{1}{7}x + 3$ |
| (c) $D(f^{-1}) = \mathbb{R}, f^{-1}(x) = \frac{1}{7}(x+3)$ |
| (d) $D(f^{-1}) = \mathbb{R}, f^{-1}(x) = \frac{1}{3}(x+7)$ |
| (e) $D(f^{-1}) = \mathbb{R}, f^{-1}(x) = \frac{1}{7}(x-3)$ |

- 28) Let A and B be two relations defined by $A = \{(x, y) \mid x \in Z, y \in Z, x < y\}$ and $B = \{(x, y) \mid x \in Z, y \in Z, x > y\}$. Which of the following is(are) TRUE?

- (a) A and B are not symmetric.
 (b) A and B are reflexive.
 (c) A is symmetric and B is not symmetric.
 (d) A is reflexive and B is not reflexive.
 (e) A is transitive and B is not transitive.

- 29) Let the relation p on the set $X = 1, 2, 3, 4$ be defined by $p = \{(x, y) \mid x, y \in X \wedge x < y\}$. $D(p)$ is equal to

- (a) X (b) $\{1, 2, 3\}$ (c) $\{2, 3, 4\}$
 (d) $\{1, 3, 4\}$ (e) $\{1, 2, 4\}$

- 30) Let $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$ be a binary relation on a set $\{1, 2, 3, 4\}$. Which of the following statements is(are) TRUE?

- (a) R is reflexive.
 (b) R is symmetric.
 (c) R is anti-symmetric.
 (d) R is transitive.
 (e) R is reflexive and anti-symmetric.

- 31) Let f be a binary relation from the set $X = \{1, 2, 3\}$ to the set $Y = \{a, b, c, d\}$. Which of the following relations f defines a function from X to Y ?

- (a) $f = \{(1, a), (2, b), (2, c), (3, c)\}$
 (b) $f = \{(1, a), (2, c), (3, c)\}$
 (c) $f = \{(1, a), (2, b)\}$
 (d) $f = \{(1, a), (2, b), (2, c), (3, d)\}$
 (e) $f = \{(1, a), (2, a), (2, a), (3, a)\}$

- 32) If set A contains four (4) elements and set B contains five (5) elements, then the number of one-to-one and onto mappings from A to B is

- (a) 120 (b) 24 (c) 64
 (d) 0 (e) 16

- 33) Let $A = \{3, 4\}$ and $B = \{3, 8\}$. Which of the following is(are) TRUE?

- (a) $A \times B = (3, 3), (8, 3), (3, 4), (8, 4)$.
 (b) $A \times B = B \times A$
 (c) $A \times B = (3, 3), (3, 8), (4, 3), (4, 8)$
 (d) $A \times B = (3, 3), (4, 8), (3, 8), (4, 3)$
 (e) $A \times B = \{(x, y) \mid x \in A, y \in B\}$

34) Which of the following is not a proper representation of a function f on $A = \{1,2,3\}$?

- (a) $f(1) = 15, f(2) = 15, f(3) = 15$
 (b) $f(1) = 8, f(2) = 8, f(3) = 10$
 (c) $f(1) = 8, f(2) = 9$
 (d) $f(1) = 4, f(2) = 5, f(3) = 6$
 (e) $f(1) = 7, f(1) = 8, f(2) = 9, f(3) = 10$

35) Consider the following truth tables for four different propositions of one variable p .

p	P1	P2	P3	P4
T	T	T	F	F
F	T	F	T	F

Which of the following gives four such propositions P1, P2, P3, P4 respectively.

- (a) $p \vee \sim p, p \vee p, \sim p \wedge \sim p, \sim (p \vee \sim p)$
 (b) $p \vee \sim p, p, \sim p, p \wedge p$
 (c) $p \vee p, p, \sim p, p \wedge p$
 (d) $p \Rightarrow p, p, \sim p, p \wedge \sim p$
 (e) $\sim (p \wedge \sim p), p, \sim p, p \wedge \sim p$

36) Which of the following is/are logically equivalent to $(p \Rightarrow \sim q) \wedge (q \Rightarrow p)$?

- (a) $\sim p$ (b) $\sim q$ (c) $(\sim p \vee q) \wedge (\sim q \vee p)$
 (d) $\sim(\sim p \wedge q)$ (e) $(\sim p \vee \sim q) \wedge (\sim q \vee p)$

37) In how many distinct ways can 5 differently colored beads be arranged to form a necklace?

- (a) 120 (b) 12 (c) 60
 (d) 24 (e) 45

38) In how many ways can the letters of the word BALLOON be arranged?

- (a) 720 (b) 630 (c) 120
 (d) 1260 (e) 180

39) How many choices do you have, if you are to select 4 correct answers out of 7?

- (a) 105 (b) 210 (c) 150
 (d) 70 (e) 35

40) If $P(A|B) = 0.5, P(B) = 0.6$ and $P(A \cup B) = 0.7$, then $P(A^c)$ is:

- (a) 0.2 (b) 0.3 (c) 0.4
 (d) 0.5 (e) 0.6