



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2022 – 1st Year Examination – Semester 2

IT2106 – Mathematics for Computing I
Multiple Choice Question Paper

(TWO HOURS)

Important Instructions :

- The duration of the paper is **2 (two) hours**.
- The medium of instruction and questions is English.
- The paper has **40 questions** and **08 pages**.
- All questions are of the **MCQ** (Multiple Choice Questions) type.
- All questions should be answered.
- Each question will have 5 (five) choices with **one or more** correct answers.
- All 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 is not printed, please inform the supervisor 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.**
- All kinds of electronic devices including calculators are **not** allowed.
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- 1) Consider the statement, "If n is divisible by 30 then n is divisible by 2 and by 3 and by 5." Which of the following statements is(are) equivalent to this statement:
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|---|
| (a) If n is not divisible by 30 then n is not divisible by 2 or not divisible by 3 or not divisible by 5 |
| (b) If n is not divisible by 30 then n is divisible by 2 or divisible by 3 or divisible by 5. |
| (c) If n is divisible by 2 and divisible by 3 and divisible by 5 then n is divisible by 30. |
| (d) If n is not divisible by 2 or not divisible by 3 or not divisible by 5 then n is not divisible by 30. |
| (e) If n is divisible by 2 or divisible by 3 or divisible by 5 then n is divisible by 30. |
- 2) If $x + \frac{1}{x} = 1$, then the value of $x^2 + 5 + \frac{1}{x^2}$ is
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|-------|--------|-------|
| (a) 3 | (b) 4 | (c) 5 |
| (d) 6 | (e) 7. | |
- 3) If $\log 27 = 1.431$, then $\log 9$ is equal to
- | | | |
|-----------|-----------|-----------|
| (a) 0.954 | (b) 0.934 | (c) 0.945 |
| (d) 0.958 | (e) 0.928 | |
- 4) If A and B are two non-empty sets, then $B \cap (A \cup B)^c$ is equal to
- | | | |
|------------------|-------------------------|---------|
| (a) A^c | (b) B^c | (c) A |
| (d) $B \cap A^c$ | (e) ϕ (empty set). | |
- 5) Let $x = \left(\frac{1}{2}\right)^{-1/2}$. Then x is equal to
- | | | |
|-----------------|----------------------------|-------|
| (a) $-\sqrt{2}$ | (b) $\sqrt{2}$ | (c) 2 |
| (d) 1 | (e) $\frac{1}{\sqrt{2}}$. | |
- 6) Which of the following statements is(are) true if the domain for all variables consists of all integers?
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|------------------------------|------------------------------|---------------------------|
| (a) $\forall n (n^2 \geq 0)$ | (b) $\forall n (n^2 \geq n)$ | (c) $\exists n (n^2 = 2)$ |
| (d) $\exists n (n^2 = n)$ | (e) $\exists n (n^2 < 0)$. | |
- 7) Let p and q be two propositions. Which of the following is (are) a **tautology (tautologies)**?
- | | |
|--|--|
| (a) $[p \wedge (p \rightarrow q)] \rightarrow q$ | (b) $[q \wedge (p \rightarrow q)] \rightarrow p$ |
| (c) $(p \vee q) \rightarrow p$ | (d) $(p \wedge q) \rightarrow p$ |
| (e) $[\sim p \wedge (p \vee q)] \rightarrow q$. | |

8) The meaning of the proposition $\exists x \forall y P(x, y)$ is

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|--|
| (a) There exists some y such that $P(x, y)$ is true for every x . |
| (b) There exists some x such that $P(x, y)$ is false for every x . |
| (c) There exists some x such that $P(x, y)$ is true for every y . |
| (d) There exists some x such that $P(x, y)$ is true for every x , |
| (e) For every y , there exists some x such that $P(x, y)$ is true. |

9) Number of proper subsets of the set $A = \{p, q, r, s\}$ is

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|-------|--------|--------|
| (a) 4 | (b) 16 | (d) 15 |
| (d) 9 | (e) 3. | |

10) Which of the following propositions is(are) logically equivalent to $p \rightarrow q$?

- | | | |
|---------------------------------|---------------------------------|-----------------------|
| (a) $\sim q \rightarrow \sim p$ | (b) $\sim p \rightarrow \sim q$ | (c) $q \rightarrow p$ |
| (d) $\sim p \vee q$ | (e) $p \vee \sim q$. | |

11) Let $A = \{2, 3, 4\}$ and $B = \{x : x \in \mathbb{R} \text{ and } x^2 - 7x + 12 = 0\}$. Which of the following **must** be true?

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

12) What is the negation of the statement $p \rightarrow (q \vee r)$?

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

13) Let p, q , and r be three propositions with truth values true, false, and false, respectively. Which of the following propositions is(are) true?

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

14) If set A is $\{a, b, c\}$ and $A - B = \emptyset$, then set B can be

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|-------------------------|-------------------|----------------|
| (a) $\{a, b, d, e\}$ | (b) $\{a, b, d\}$ | (c) $\{a, b\}$ |
| (d) $\{a, b, c, d, e\}$ | (e) $\{d, e\}$. | |

- 15) If $A = \{1, 2, 3\}$, $B = \{2, 4, 5\}$, and $C = \{2, 5\}$, then $(A - B) \times (B - C)$ is equal to
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|----------------------------------|--|----------------------|
| (a) $\{(1, 4), (3, 4)\}$ | (b) $\{1, 3, 4\}$ | (c) $(1, 4), (2, 4)$ |
| (d) $\{(1, 4), (3, 4), (4, 2)\}$ | (e) $\{(1, 4), (3, 4), (4, 2), (4, 5)\}$. | |
- 16) Let A and B be two sets. Which of the following statements is(are) false?
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|------------------------------|------------------------------|-----------------------|
| (a) $A - B = A \cap B^C$ | (b) $A - B = A - (A \cap B)$ | (c) $A - B = A - B^C$ |
| (d) $A - B = (A \cup B) - B$ | (e) $A - B = B - A$. | |
- 17) Let $A = \{a, b, c, d, e, f, g, h, i, k\}$. Then the number of subsets of A containing exactly two elements is
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|--------|-----------|--------|
| (a) 20 | (b) 45 | (c) 90 |
| (d) 40 | (e) 1024. | |
- 18) Let X and Y be two finite sets. If the total number of subsets of X is 112 more than the total number of subsets of Y , then the number of elements in X is
- | | | |
|-------|---------|-------|
| (a) 5 | (b) 12 | (c) 9 |
| (d) 7 | (e) 11. | |
- 19) Let A be a set with n ($n \geq 2$) elements and B be a set with 2 elements. How many onto (surjective) functions are there from A to B ?
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|---------------|--------------------|---------------|
| (a) 2^n | (b) $2^n - 1$ | (c) $2^n - 2$ |
| (d) 2^{n-1} | (e) $2(2^n - 2)$. | |
- 20) In a group of 72 students, 47 have background in Physics, 59 have background in Mathematics and 42 have background in both the subjects. How many students do not have background in both Physics and Mathematics?
- | | | |
|--------|---------|--------|
| (a) 8 | (b) 64 | (c) 13 |
| (d) 25 | (e) 34. | |
- 21) Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. Then $(f \circ g)(2)$ is equal to
- | | | |
|--------|---------|--------|
| (a) 23 | (b) 72 | (c) 15 |
| (d) 56 | (e) 19. | |

22) Which of the following conditional statements is(are) true?

- (a) If $2 + 2 = 4$, then $2 + 3 = 5$.
- (b) If $2 + 2 = 4$, then $2 + 3 = 6$.
- (c) If $2 + 2 = 5$, then $2 + 3 = 5$.
- (d) If $2 + 2 = 5$, then $2 + 3 = 4$.
- (e) If $100 > 200$, then $200 < 300$.

23) What is the negation of the statement “No one wants to buy my computer”?

- (a) All want to buy my computer.
- (b) Someone wants to buy my computer.
- (c) Everyone wants to buy my computer.
- (d) Everyone does not want to buy my computer.
- (e) None of these.

24) Which of the following statements is(are) true if the domain consists of all integers?

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|-----------------------------|------------------------------|---------------------------|
| (a) $\forall n (n + 1 > n)$ | (b) $\forall n (3n \leq 4n)$ | (c) $\exists n (2n = 3n)$ |
| (d) $\forall n (n^2 > n)$ | (e) $\exists n (n = -n)$. | |

25) Let $Q(x, y)$ be the predicate “ $x + y = x - y$.” If the domain for both variables consists of all integers, which of the following statements is(are) true?

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|-----------------------------------|-------------------------------------|-----------------------------------|
| (a) $Q(2, 2)$ | (b) $\forall y Q(1, y)$ | (c) $\exists x \exists y Q(x, y)$ |
| (d) $\exists y \forall x Q(x, y)$ | (e) $\forall x \forall y Q(x, y)$. | |

26) Let $f: \mathbb{N} \rightarrow \mathbb{N}$ be a function defined by $f(n) = n^2 + 2$ for all $n \in \mathbb{N}$, where \mathbb{N} is the set of all positive integers. Then f is

- (a) injective (one to one)
- (b) surjective (onto)
- (c) bijective
- (d) both injective and surjective
- (e) neither injective nor surjective.

27) Let $A = \{a, b, c, d\}$ and $B = \{1, 2, 3, 4, 5\}$. How many one to one function can be defined from A to B ?

- | | | |
|---------|----------|--------|
| (a) 24 | (b) 16 | (c) 32 |
| (d) 120 | (e) 144. | |

- 28) Let $f: A \rightarrow A$ be an **onto** function, where $A = \{1, 2, 3\}$. Then which of the following statements is(are) true.

- (a) f is one to one.
- (b) f may be one to one or many to one
- (c) f is bijective
- (d) f may be or may not be bijective
- (e) None of the above.

- 29) Let $R = \{ (1,1), (1,2), (2,1), (2,2), (3,4), (4,1), (4,4) \}$ be a 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) None of the above.

- 30) Let R be a relation defined on the set of integers (\mathbb{Z}) by $(x, y) \in R$ if and only if $x + y \leq 3$. 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) None of the above.

- 31) How many relations exist from set X to set Y if the set X and set Y has 3 and 4 elements respectively?

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|--------|---------|----------|
| (a) 12 | (b) 128 | (c) 4096 |
| (d) 8 | (e) 16 | |

- 32) Consider the binary relation $R = \{(x, y), (x, z), (z, x), (z, y)\}$ on the set $\{x, y, z\}$. Which one of the following is(are) true?

- (a) R is not symmetric but antisymmetric
- (b) R is symmetric but not antisymmetric
- (c) R is neither symmetric nor antisymmetric
- (d) R is not transitive
- (e) R is both symmetric and antisymmetric.

33) Let p and q be two propositions. Which of the following arguments is/are **invalid**?

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|-----------------------------------|---|---------------------------------|
| (a) $p \rightarrow q, q \vdash q$ | (b) $p \rightarrow q, \sim q \vdash \sim p$ | (c) $p \vee q, \sim p \vdash q$ |
| (d) $p \vee q \vdash p$ | (e) $p \wedge q \vdash p$. | |

34) The union of events A and B is the event containing

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| (a) All the sample points common to both A and B . |
| (b) All the sample points belonging to A or B . |
| (c) All the sample points not belonging to A or B . |
| (d) All the sample points belonging to A or B or both. |
| (e) All the sample points belonging to A or B , but not both |

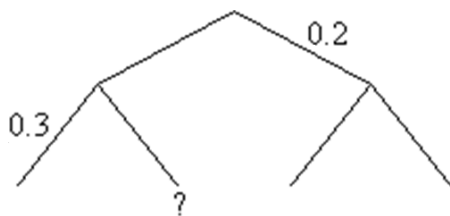
35) If $A \subset B$ then $P(B|A)$ is equals to

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|-----------------|
| (a) 1 |
| (b) $P(A)/P(B)$ |
| (c) $P(B)/P(A)$ |
| (d) $P(A)$ |
| (e) $P(B)$. |

36) A coin is tossed and a die is rolled, find the probability that the coin shows a tail and the die shows an even number.

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|------------|--------------|------------|
| (a) $1/12$ | (b) $3/12$ | (c) $4/12$ |
| (d) $6/12$ | (e) $7/12$. | |

37) What is the missing joint probability value shown by a question mark on the tree diagram shown below?



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|-----------|
| (a) 0.06 |
| (b) 0.15 |
| (c) 0.50 |
| (d) 0.56 |
| (e) 0.70. |

- 38) A box contains 3 red marbles and 2 green marbles. Three marbles are drawn at random without replacement. What is the probability that two marbles are red and one marble is green?

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

- 39) Two dice are rolled. Probability of getting a total of 4 given that both-faces are similar is:

(a) $\frac{1}{36}$ (b) $\frac{3}{36}$ (c) $\frac{5}{36}$
(d) $\frac{1}{6}$ (e) 1.

- 40) Company A produces 10% defective products, Company B produces 20% defective products and C produces 5% defective products. If choosing a company is an equally likely event, then find the probability that the product chosen is defective.

(a) 0.22 (b) 0.12 (c) 0.11
(d) 0.21 (e) 0.35
