UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2016 – 1st Year Examination – Semester 2

IT2105 - Mathematics for Computing I

Multiple Choice Question Paper

22nd October 2016

(TWO HOURS)

Important Instructions :

- The duration of the paper is **2 (two) hours**.
- The medium of instruction and questions is English.
- The paper has **42 questions** and **8 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 0 (*All the incorrect choices are marked & no correct choices are marked*) to +1 (*All the correct choices are marked & no incorrect choices are marked*).
- 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.**
- Calculators are not allowed

Notations:

Z – set of integers N – set of positive integers

R – set of real numbers $\varnothing$ - (null) empty set

U – Universal set R^+ - set of positive real numbers

1) What is the solution of $\left(\frac{1}{2}\right)^{2x+1} = 1$?

(a) $x = \frac{1}{2}$	(b) $x = -\frac{1}{2}$	(c) X=0
(d) $x = \frac{1}{\sqrt{2}}$	(e) $x = -\frac{1}{\sqrt{2}}$	

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

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

3) Which of the following is/are a solution/s of $2\log_4(x+2) = 1 + \log_4(x+3)$ **?**

(a) $x = \sqrt{2}$.	(b) $x = 2\sqrt{2}$.	(c) $x = -\sqrt{2}$.
(d) $x = -2\sqrt{2}$.	(e) 2 .	

4) Let A = {a, d, f, h, k} and B = {b, d, h, l, m}. Find (A ∪ B) \ A and A \ (A ∩ B).

(a) (A ∪ B) \ A = B, A \ (A ∩ B) = B
(b) (A ∪ B) \ A = {b, l, m}, A \ (A ∩ B) ={a, f, k}
(c) (A ∪ B) \ A = A, A \ (A ∩ B) = B
(d) (A ∪ B) \ A = { }, A \ (A ∩ B) ={a, f, k}
(e) (A ∪ B) \ A = { b,l,m}, A \ (A ∩ B) ={ }

5) Let A and B be any three non-empty sets. Which of the following are/is true?

(a) A ∩ (A ∪ B) = B.	(b) A \ (A ∩ B) = A \ B.	(c) A ∪(A ∩ B)= A.
(d) A ∩ (A ∪ B) = A.	(e) A ∪(A ∩ B)= B.	

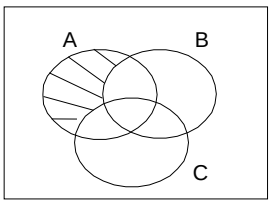
6) Let $S = \{(x,y)|\ x,y \in Z \text{ and } x^2 + y^2 = 10\}$ and $T = \{(x,y)|\ x,y \in Z \text{ and } x - y = 4\}$. Then $S \cap T$ is equal to

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

7) Let A and B be any two non-empty sets. If A is a subset of B, which of the following **cannot** be true?

(a) $A = B$. (b) $B \subset A$. (c) $A \subset B$. (d) $B \subseteq A$. (e) $A \cap B = \varnothing$.

8) Consider the following Venn diagram.



Which of the following is represented by the shaded region in the above Venn diagram?

(a) $(A \cap B)^c$.	(b) $B^c \cap (B \cup A)$.
(c) $(A \cup B) \cap (A \cup C)$.	(d) $(B^c \cap C^c) \cap A$.
(e) $(A \cap C)^c$.	

9) Let X be any subset of the universal set U . Which of the following is(are) **always** correct?

(a) $X \subset X$.	(b) $\varnothing \subset X$.	(c) $X \subset U$.
(d) $X \subseteq X$.	(e) $\varnothing \subseteq X$.	

10) Let A,B and C be any three sets. If $A \subset B$ and $B \subset C$, which of the following are **always** correct?

(a) $B \subseteq C$.	(b) $A \subseteq C$.	(c) $A \subset C$.
(d) $A^c \cap C = \varnothing$.	(e) $A \cup C = A$.	

11) Let A and B be two non-empty sets and $A \cap B \neq \varnothing$. If P(A) is a power set of A, which of the following is/are true?

(a) $A \in P(A)$.	(b) $P(A) \cap P(B) = \varnothing$.	(c) $\lvert P(A)\rvert = 2^{\lvert A\rvert}$.
(d) $P(A) \cap P(B) \subseteq P(A)$.	(e) $P(A) \cup P(B) = A \cup B$.	

12) Let p and q be two propositions. Which of the following proposition(s) is/are **contradictions**?

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

13) Let *p* and *q* be two propositions. Which of the following is(are) **tautologies**?

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

14) Let p and q be two propositions. Which of the following pairs of propositions are logically equivalent?

(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) $p \Leftrightarrow q, (\sim p \vee q) \vee (p \vee \sim q)$	

15) Consider the following truth table of the proposition $\boldsymbol{\lambda}$ with three propositional variables *p*, *q* and *r*.

p	*q*	*r*	$\boldsymbol{\lambda}$
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 $\boldsymbol{\lambda}$?

(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) $(p \vee q \vee \sim r)$

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

(a) $\sim p \Leftrightarrow q, p \vdash q$	(b) $p \Leftrightarrow q, \sim p \vdash \sim q$	(c) $\sim p \Leftrightarrow \sim q, p \vdash \sim q$
(d) $p \Leftrightarrow q, p \vdash q$	(e) $p \Leftrightarrow \sim q, p \vdash q$	

17) Let p(x) be a predicate defined by $x < 2$ where $x \in R$. Which of the following are/is true?

(a) $\exists x\ p(x)$ is false.	(b) $\exists x\ p(x)$ is true.	(c) $\exists x \sim p(x)$ is false.
(d) $\exists x \sim p(x)$ is true.	(e) $\sim\exists x\ p(x)$ is true.	

18) Let p(x) and q(x) be predicates defined by $x < 1$ and $x > 1$ for $x \in R$ respectively. Which of the following are/is true?

(a) $\exists x\ p(x) \vee q(x)$.	(b) $\forall x\ p(x) \vee q(x)$.	(c) $\exists x\ p(x) \wedge q(x)$.
(d) $\forall x\ p(x) \wedge q(x)$..	(e) $\forall x\ p(x)$.	

19) Let p(x) and q(x) be predicates defined by $x < 0$ and $x \geq 0$ for $x \in R$ respectively. Which of the following are/is true?

(a) $\exists x\ p(x) \wedge \exists x\ q(x)$.	(b) $\exists x\ p(x) \vee \exists x\ q(x)$.	(c) $\forall x\ p(x)$.
(d) $\forall x\ p(x) \vee \forall x\ q(x)$.	(e) $\forall x\ p(x) \wedge \forall x\ q(x)$.	

20) Let p(x) be a predicate defined on R. Which of the following is/are logically equivalent to $\exists x\ p(x)$?

(a) $\forall x\ p(x)$.	(b) $\forall x \sim p(x)$.	(c) $\sim\forall x\ p(x)$.
(d) $\sim\exists x \sim p(x)$	(e) $\sim\forall x \sim p(x)$.	

21) Let $A=\{1,2,3,4,5,6,7,8\}$ and p(x,y) be predicate defined on A by $x > y$. Which of the following is/are true.

(a) $\forall x\ \exists y\ p(x,y)$.	(b) $\forall x\ \forall y\ p(x,y)$.	(c) $\exists x\ \forall y\ p(x,y)$.
(d) $\exists x\ \exists y\ p(x,y)$	(e) $\forall x\ \forall y \sim p(x,y)$.	

22) Suppose p, q, r and s represent the following propositions.

p: Nihal retires, q: Weerasiri will take charge of Finance, r: Krishanthan will take charge of Finance, s: Wickremasinghe still has influence.

Consider the following argument:

"If Nihal retires, either Weerasiri or Krishanthan will take charge of Finance. If Wickremasinghe still has influence, then Weerasiri won't take charge of Finance. Nihal won't retire. Therefore, if Krishanthan doesn't take charge of Finance, Wickremasinghe no longer has influence."

Which of the following correctly represent(s) the given argument?

(a) $p \wedge q \vee r, s \Rightarrow \sim p, \sim p \vdash \sim r \Rightarrow \sim s$	(b) $p \Rightarrow q \vee r, s \Rightarrow \sim q, \sim p \vdash r \Rightarrow s$	(c) $p \Rightarrow q, p \Rightarrow s, \sim p, \vdash \sim s$
(d) $p \Rightarrow q \vee r, s \Rightarrow \sim q, \sim p \vdash \sim r \Rightarrow \sim s$	(e) $p \wedge q \vee r, s \Rightarrow \sim p, \sim p \vdash r \Rightarrow s$	

23) Let A = {1, 2, 3, 4, 5, 6}, B = {T, H} and A x B be the Cartesian Product of A and B. Which of the following is/are true?

(a) $(6,1) \in A \times B$	(b) $(T,1) \in A \times B$	(c) $(6,H) \in A \times B$
(d) $(T, H) \in A \times B$	(e) $(H, H) \in A \times B$	

24) Let ρ be a relation defined on a set X. Then ρ is said to be symmetric if

(a) $\forall x, x \in D(\rho) \Rightarrow (x,x) \in \rho$	(b) $\forall x, \forall y\ (x,y) \in \rho \Rightarrow (y,x) \in \rho$	(c) $\forall x, \forall y\ (y,x) \in \rho \Rightarrow (x,y) \in \rho$
(d) $\exists x,y\ (x,y) \in \rho \Rightarrow (y,x) \in \rho$	(e) $\exists x,y\ (y,x) \in \rho \Rightarrow (x,y) \in \rho$	

25) Let the relation ρ on the set X={2, 4, 7, 8, 9} be defined by ρ={ (x,y) | x,y $\in$ X , x divides y}. Which of the following is/are true?

(a) $(7,8) \notin \rho$	(b) $(8,9) \in \rho$	(c) $\rho = \varnothing$
(d) ρ = {(2,4),(2,8),(4,8)}	(e) ρ = {(2,4),(2,8)}	

26) Let the relation α on the set X={3, 6, 12} be defined by α ={ (x,y)|x,y $\in$ X $\wedge$ x divides y}. α^{-1} is equal to

(a) {(3,6), (3,12), (6,12)}	(b) {(6,3), (12,3), (12,6)}	(c) { (x,y) | (y,x) $\in\alpha$ }
(d) { (x,y)| x,y $\in$ X $\wedge$ y divides x}	(e) { (y,x)| x,y $\in$X $\wedge$ y divides x }	

27) Let α be a relation defined on the set of all people on earth by α={(a,b)| a married b}. Which of the following is/are true?

(a) α is symmetric.	(b) α^{-1} is symmetric.	(c) α is transitive.
(d) α is reflexive.	(e) $\alpha^{-1} = \alpha$.	

28) Which of the following **must** be true if the relation ρ is an equivalence relation?

(a) ρ is reflexive.	(b) ρ is symmetric.	(c) ρ is transitive.
(d) $D(\rho) = R(\rho)$.	(e) $D(\rho) \subset R(\rho)$.	

29) Let ρ ={(1,4), (2,4), (3,5)} and α = {(4,1),(5,3)}. Find α **o** ρ.

(a) {(4,4), (5,5)}	(b) {(1,1), (2,1), (3,3) }	(c) ρ
(d) α	(e) {(1,1), (3,1), (2,2) }	

30) Let ρ be a relation defined on A={a,b,c} by ρ ={(a,a), (b,b),(c,c), (a,b),(b,a)}. Find $[a]_\rho$.

(a) {(a,b),(b,a)}	(b) {(a,b)}	(c) {(a,a)}
(d) {a,b}	(e) { a }	

31) When is f said to be a 1-1 function?

(a) $\forall x \forall y\ x \in D(f), y \in D(f),\ x = y \Rightarrow f(x) \neq f(y)$.
(b) $\forall x \forall y\ x \in D(f), y \in D(f),\ x \neq y \Rightarrow f(x) = f(y)$.
(c) $\forall x \forall y\ x \in D(f), y \in D(f),\ f(x) = f(y) \Rightarrow x = y$.
(d) $\exists x \exists y\ x \in D(f), y \in D(f),\ f(x) = f(y) \Rightarrow x = y$.
(e) $\exists x \exists y\ x \in D(f), y \in D(f),\ x \neq y \Rightarrow f(x) = f(y)$.

32) Let A={a,b,c} and f be a function defined on A. Which of the following cannot represent f ?

(a) $f(a)=10, f(b)=10, f(c)=10$. (b) $f(a)=8, f(b)=8, f(c)=10$.
(c) $f(a)=7, f(a)=8, f(b)=9, f(c)=10$. (d) $f(a)=8, f(b)=9$.
(e) $f(a)=1, f(b)=2, f(c)=3$.

33) If f is a 1-1 function on set A, which of the following is/are true?

(a) f^{-1} is 1-1.
(b) $f^{-1} \neq f$.
(c) f **o** f is not 1-1.
(d) $D(f^{-1}) \neq R(f)$
(e) f **o** f^{-1} is 1-1.

34) Suppose A and B are two non-empty sets and the function f maps A **into** B. Which of the following must be true?

(a) $D(f) = A$ (b) $D(f) \neq A$ (c) $R(f) = B$
(d) $R(f) \subseteq B$ (e) $R(f) \subset B$

35) In how many ways can the letters of the word ADDRESS be arranged?

(a) 1260 (b) 720 (c) 630
(d) 30 (e) 120

36) How many choices do you have, if you are to select 3 correct answers out of 5 ?

(a) 10 (b) 20 (c) ${}^5P_3$
(d) 15 (e) ${}^5C_3$

37) If $P(A|B) = 0.6$, $P(B) = 0.4$ and $P(A \cup B) = 0.6$, then $P(A^C)$ is:

(a) 0.24 (b) 0.36 (c) 0.44
(d) 0.56 (e) 0.66

38) Suppose that X, Y and Z are three mutually exclusive and exhaustive events in a sample space with probabilities (1-3p)/3, (1+3p)/2 and (1-p)/6 respectively. What is the value of p?

(a) 0.0	(b) 0.2	(c) 0.4
(d) 0.6	(e) 1.0	

39) If two events A and B are independent, then,

(a) $P(A \cup B) = P(A) + P(B)$	(b) $P(A \cap B) = P(A) + P(B)$	(c) $P(B\|A) = P(B) * P(A)$
(d) $P(B\|A) = P(B)$	(e) $P(B\|A) = P(A)$	

40) The final examination grade of a given student may be A, B, C or D (The highest grade is A and they are ranked in decreasing order). The probabilities that a student will obtain grades A, B or D are 0.30, 0.35 and 0.15 respectively. What is the probability that the student will receive at least a C grade?

(a) 0.20.	(b) 0.35.	(c) 0.65
(d) 0.80	(e) 0.85	

41) Which of the following statements is correct?

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

42) In a certain day care class, 30% of the children are from Colombo district, 50% of them are from Gampaha district and the other 20% are from other districts. One day they play a game together. In the first run, 65% of the Colombo district ones, 82% of the Gampaha district ones and 50% of the children from other districts are selected. Now, if a child is selected randomly from the class, and we know that he/she is not in the first game, what is the probability that the child is from Gampaha district?

(a) 0.06	(b) 0.15	(c) 0.305
(d) 0.5	(e) 0.09	

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