UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2014/2015 – 1st Year Examination – Semester 2

IT2105 - Mathematics for Computing I

Multiple Choice Question Paper

25th July 2015

(TWO HOUR)

Important Instructions :

- The duration of the paper is **2 (two) hour**.
- The medium of instruction and questions is English.
- The paper has **41 questions** and **9 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.**

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) Evaluate $(4a^6b^4c^2)^{1/4}$ when $a = 2, b = 3, c = 9$

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

2) $\dfrac{x^{\frac{5}{6}} \times y^{\frac{2}{3}}}{x^{\frac{1}{6}} \times y^{\frac{1}{2}}}$ is equal to

(a) $x^{\frac{4}{6}} \times y^{\frac{1}{3}}$.	(b) $(x^2 \times y)^{1/3}$.	(c) $x^{\frac{2}{3}} \times y^{\frac{1}{6}}$.
(d) $(x^4 \times y)^{1/6}$.	(e) $(x\,y)^{5/6}$.	

3) $(-2) + \log_2 20$ is equal to

(a) $\log_2 3$.	(b) $\log_{10} 2 * \log_{10} 3$.	(c) $\log_2 5$.
(d) $\dfrac{\log_{10} 3}{\log_{10} 2}$.	(e) $\dfrac{\log_{10} 5}{\log_{10} 2}$.	

4) Let A = {1,4,8,9} and B= {3, 4, 6, 9, 10}. Find A $\cup$ B, A $\cap$ B and A \ B.

(a) A $\cup$ B={4,9}, A $\cap$ B={1,3,4,6,8,9,10}, A \ B={3,6,10}
(b) A $\cup$ B=={1,3,4,6,8,9,10}, A $\cap$ B={4,9}, A \ B={3,6,10}
(c) A $\cup$ B=={1,3,4,6,8,9,10}, A $\cap$ B={4,9}, A \ B={1,8}
(d) A $\cup$ B=={1,3,4,6,8,9,10}, A $\cap$ B={4,9}, A \ B=A
(e) A $\cup$ B=={1,3,4,6,8,9,10}, A $\cap$ B={4,9}, A \ B={3,6,10}

5) Let S = {(x, y) |x, y$\in$Z, x – y = 2} and T = {(a, b) | a, b$\in$Z, a + 2b = 8}.

S $\cap$ T is equal to

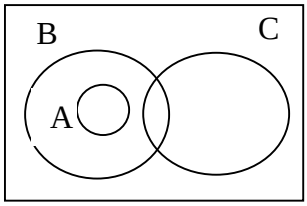
(a) {4,2}.	(b) {(2,4)}.	(c) {(x, x-2) | x = 4 }.
(d) {(4,-2)}.	(e) {(4,2)}.	

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

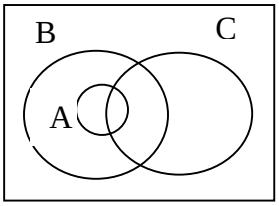
(a) $A \cap B \neq \varnothing$	(b) $A \cap B = \varnothing$	(c) $A \cap B \neq A$
(d) $A \cap B = A$	(e) $B \subseteq A$	

7) Let A,B and C be three non-empty sets such that $A \subseteq B$, $A \cap C = \varnothing$ and C is not a proper subset of B. Which of the following Venn diagrams reflect these properties ?

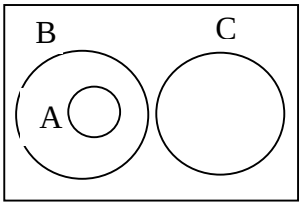
(a)



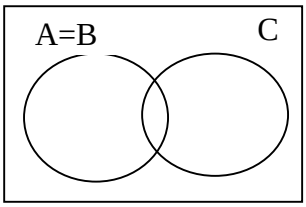
(b)



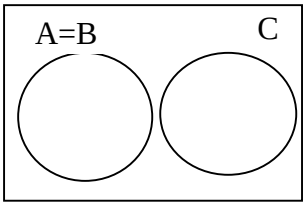
(c)



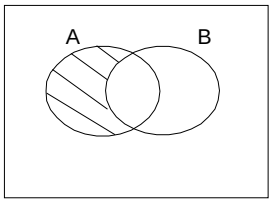
(d)



(e)



8) Consider the following Venn diagram.



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

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

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

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

10) Let A and B be any two sets. Which of the following are propositions?

(a) $A \subseteq A \cup B$	(b) $A \subseteq B$	(c) $A \subset A$
(d) $x \in A$	(e) $A \cap B \subseteq A \cup B$	

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

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

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

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

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

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

14) If p(x) is a predicate defined on R and $\forall x\ p(x)$ is **false**, 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) $\forall x\ \sim p(x)$ is true.	

15) Let the two predicates p(x) and q(x) be defined on R and let $\exists x\ (p(x) \wedge q(x))$ be **true**. Which of the following **must** be true?

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

16) Let the two predicates p(x) and q(x) be defined on R and suppose $\forall x\ (p(x) \wedge q(x))$ is **true**. Which of the following **must** be true?

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

17) Let $A=\{1,2,3,4,5,6,7,8,9,10\}$ and $x, y \in A$. Which of the following is/are true?

(a) $\forall x\ \exists y\ x + y < 14$	(b) $\forall x\ \forall y\ x + y < 14$	(c) $\exists x\ \forall y\ x + y < 14$
(d) $\exists x\ \exists y\ x + y < 14$	(e) $\forall x\ \exists y\ x < y$	

18) Consider the following truth table of the proposition, **s** with the three propositional variables *p*, *q* and *r*.

p	q	r	**s**
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

Find **s**.

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

19) Suppose p, q, r and s represent the following propositions.
p: There is inflation, q: Prices are high, r: Wages are high, s: There are price controls.

Consider the following argument:

"If prices are high, then wages are high. Prices are high or there are price controls. If there are price controls, then there is no inflation. There is inflation. Therefore, wages are high".

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

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

20) Consider the following propositions.

(i) $\forall x\ p(x)$ (ii) $\forall x \sim p(x)$ (iii) $\sim\forall x \sim p(x)$ (iv) $\exists x\ p(x)$ (v) $\exists x \sim p(x)$ (vi) $\sim\exists x, \sim p(x)$

Which of the following pairs of propositions is/are equivalent?

(a) (i) and (ii)	(b) (i) and (iii)	(c) (i) and (vi)
(d) (iii) and (iv)	(e) (iii) and (v)	

21) Let p and q be two atomic propositions. Which of the following represent(s) the **Conjunctive Normal Form** of $p \vee (q \wedge (r \vee s))$?

(a) $p \vee q \vee r \vee s$	(b) $p \vee (q \wedge r) \vee (q \wedge s)$	(c) $(p \vee q) \wedge (p \vee r \vee s)$
(d) $p \wedge q \wedge r \wedge s$	(e) $(p \vee q \vee r) \wedge (p \vee q \vee s)$	

22) Let A = {1, 2,3,4,5,6} and B={T,H}. If A x B is the Cartesian Product of A and B, then **n**(A x B) is equal to

(a) 6	(b) 2	(c) 8
(d) 12	(e) 4	

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

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

24) Let the relation ρ on the set X={1,2,3,4} be defined by $\rho=\{ (x,y)|x,y \in X \wedge x < y\}$. $D(\rho)$ is equal to

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

25) Let the relation β on the set X={1,2,3,4} be defined by $\beta=\{ (x,y)|x,y \in X \wedge x < y\}$. β^{-1} is equal to

(a) $\{ (x,y)\|x,y \in X \wedge x < y\}$	(b) $\{ (x,y)\|x,y \in X \wedge y < x\}$	(c) $\{ (y,x)\|x,y \in X \wedge y > x\}$
(d) $\{ (x,y)\|x,y \in X \wedge y \leq x\}$	(e) $\{ (y,x)\|x,y \in X \wedge y \geq x\}$	

26) Let α be a relation defined on people by $\alpha=\{(a,b)|$ a is a brother of b$\}$. Which of the following is/are true?

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

27) If ρ is a symmetric relation, then which of the following is/are true?

(a) $\forall x,\ x\in D(\rho) \Rightarrow (x,x)\in\rho$	(b) $\exists x, x\in D(\rho) \Rightarrow (x,x)\in\rho$	(c) $\forall x,\forall y\ (x,y)\in\rho \Rightarrow (y,x)\in\rho$
(d) $\exists x, \exists y\ (x,y)\in\rho \Rightarrow (y,x)\in\rho$	(e) ρ^{-1} is symmetric	

28) Let ρ be the relation defined on A={1,2,3} by ρ ={(1,2), (1,3), (2,1), (3,3)}. Find ρ **o** ρ.

(a) {(1,2), (1,3), (2,1),(3,3)}	(b) {(1,1), (1,3), (2,2),(2,3),(3,3) }	(c) {(1,1), (2,2), (3,3) }
(d) {(2,1), (3,1), (1,2),(3,3)}	(e) {(1,1), (3,1), (2,2) }	

29) Let ρ be the equivalence relation defined on A={1,4, 6} by ρ ={(1,1), (4,4),(6,6), (4,6),(6,4)}. Find $[4]_\rho$.

(a) {(4,4),(4,6)}	(b) {4,6}	(c) {1,4,6}
(d) {4}	(e) { 6 }	

30) Let α and ρ be two relations defined as follows.

$\alpha=\{(x,y)|\ x\in Z, y\in Z, x \le y\}$ $\rho=\{(x,y)|\ x\in Z, y\in Z, x > y\}$

Which of the following is/are true?

(a) α - symmetric, ρ - transitive
(b) α - reflexive, ρ - symmetric
(c) α - symmetric, ρ - reflexive
(d) α - reflexive, ρ - transitive
(e) α - reflexive, ρ - reflexive

31) If f is a 1-1 function, which of the following is/are true?

(a) f^{-1} is 1-1
(b) $f^{-1} = f$
(c) $\forall x_1, \forall x_2,\ x_1 \in D(f), x_2 \in D(f),\ f(x_1) = f(x_2) \Rightarrow x_1 = x_2$
(d) $D(f^{-1}) = R(f)$
(e) $\forall x_1, \forall x_2, x_1 \in D(f), x_2 \in D(f),\ f(x_1) \neq f(x_2) \Rightarrow x_1 = x_2$

32) Suppose A and B are two non-empty sets and the function f maps A **onto** B. Which of the following is **false**?

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

33) Let the functions f and g be defined on R by $f(x)=5x-2$ and $g(x)=3x+2$. Then $(g \circ f)(x)$ is equal to

(a) $g(f(x))$	(b) $5x - 2$	(c) $15x-4$
(d) $3x + 2$	(e) $15x + 8$	

34) In how many ways can the letters of the word AUGUST be arranged?

(a) 720	(b) 15	(c) 30
(d) 45	(e) 360	

35) How many choices do you have, if you are to select 3 gifts from a total of 8 different gifts?

(a) 336	(b) 24	(c) ${}^{8}P_{3}$
(d) 56	(e) ${}^{8}C_{3}$	

36) A bag contains x white buttons, y black buttons and z yellow buttons. Two buttons are drawn at random, with the first being replaced before the second is drawn. What is the probability (in terms of x, y and z) that both buttons are white?

(a) $\frac{x}{x+y+z}$	(b) $\frac{x^2}{x+y+z}$	(c) $\frac{x^2}{(x+y+z)^2}$
(d) $\frac{x}{x+y}$	(e) $\frac{x}{(x+y+z)^2}$	

37) After each throw of a die, the face that shows is marked with red color. What is the probability that after 6 throws all faces of the die will be marked red?

(a) $\frac{43}{216}$	(b) $\frac{5}{324}$	(c) $\frac{4}{216}$
(d) $\frac{4}{182}$	(e) $\frac{5}{216}$	

38) Consider a throw of two six sided dice. What is the probability that the sum of two dice will be greater than 8, given that the first die is 6?

(a) $\frac{1}{2}$	(b) $\frac{3}{4}$	(c) $\frac{2}{3}$
(d) $\frac{7}{12}$	(e) 1	

39) 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.	

40) Two fair coins are tossed simultaneously. If one of them turned head, what is the probability that the other one also turn head?

(a) 0.01	(b) 0.05	(c) 0.25
(d) 0.50	(e) 1	

41) If A and B are any two events, then $P(\bar{A} \cap \bar{B})$ is equal to

(a) $1 - P(A \cup B)$	(b) $1 - P(A \cap B)$	(c) $1 - P(\bar{A} \cap B)$
(d) $1 - P(A \cap \bar{B})$	(e) $1 - P(\bar{A} \cup \bar{B})$	

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