UNIVERSITY OF COLOMBO, SRI LANKA
UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2008/2009 – 1st Year Examination – Semester 2

IT2103: Mathematics for Computing I

08th August, 2009
(TWO HOURS)

Important Instructions :

- The duration of the paper is 2 (two) hours.
- The medium of instruction and questions is English.
- The paper has 45 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 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 ϕ - (null) empty set
S – Universal set R^+- set of non-negative real numbers

1) $\log_3 54$ is equal to

(a) $\frac{\log_{10} 54}{\log_{10} 3}$	(b) $3+\frac{\log_{10} 2}{\log_{10} 3}$	(c) $2+\frac{\log_{10} 3}{\log_{10} 2}$
(d) $\frac{\log_{10} 3}{\log_{10} 54}$	(e) $3+\log_3 2$	

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

(a) $x^{\frac{1}{5}} \times y^{\frac{2}{3}}$	(b) $\frac{1}{x^{\frac{1}{5}} \times y^{\frac{2}{3}}}$	(c) $\frac{1}{x^{\frac{1}{5}} \times y^{-\frac{2}{3}}}$
(d) $x^{-\frac{1}{5}} \times y^{\frac{2}{3}}$	(e) xy	

3) How many distinct permutations can be formed from all the letters of the word "**MIND**" ?

(a) 4!	(b) 3!	(c) 2!	(d) 24	(e) 6

4) Out of the positive integers from 1 to 100, how many numbers are divisible by 3 ?

(a) 30	(b) 31	(c) 32	(d) 33	(e) 34

5) How many distinct permutations can be formed from all the letters of the word "**COMMITTEE**".

(a) 9!	(b) $9!/(2! \times 2! \times 2!)$	(c) 9!/ (2!x 3)
(d) 9!/ 6!	(e) 6!	

6) In how many ways can 6 people arrange themselves around a circular table?

(a) 60	(b) 120	(c) 720	(d) 6!	(e) 5!

7) In how many ways can a committee consisting of 5 persons be chosen from among 5 men and 4 women?

(a) $9!/(5! \times 4!)$	(b) $9!/(4! \times 5!)$	(c) $9!/5!$
(d) $126!$	(e) 3024	

8) In how many ways can a committee consisting of 2 men and at least 2 women be chosen from 4 men and 3 women?

(a) 9	(b) 12	(c) 24	(d) 48	(e) 52

9) To have 16 elementary outcomes in the sample space, how many times has a coin to be tossed?

(a) 2	(b) 3	(c) 4	(d) 5	(e) 6

10) Suppose a fair die is tossed once. Let A be the event that an odd number appears on top of the die and B be the event that an even number appears on the top of the die. Then $P(A \cup B)=$

(a) 1/2	(b) 1/3	(c) 1/6	(d) 1	(e) 2

11) Which of the following sentences is/are propositions?

(a) Sri Lanka is in the Indian Ocean.	(b) 2 + 3 = 20
(c) What a beautiful day!	(d) If x is an integer, then x > 0.
(e) If x is a positive integer, then $x < 0$ or $x \geq 0$.	

12) Which of the following sentences is/are correct?

(a) All Sentences are propositions.
(b) All True sentences are propositions.
(c) All False Sentences are propositions.
(d) A proposition must be either true or false.
(e) All false propositions must be true.

13) Consider the following:

(i) Not all mathematical computations can be done by using computers.

(ii) Some mathematical computations can be done using computers.

(iii) Wish you all the best.

(iv) Somebody wished the president a long life.

Which of the following is/are correct?

(a) (i) is a proposition but (ii) is not a proposition.
(b) Both (i) and (ii) are propositions.
(c) Both (iii) and (iv) are not propositions.
(d) (iv) is a proposition
(e) If (iii) is a proposition then (iv) is a position.

14) Consider the following statements:

(i) If I am not happy, then I will listen to music.

(ii) I will not listen to music and I will go to see a friend.

(iii) If I will listen to music, then I will not go to see a friend.

Now:
'I am happy' is denoted by <u>one of</u> p, not p, q, not q, r, not r.
'I will listen to music' is denoted by <u>one of</u> p, not p, q, not q, r, not r.
'I will go to see a friend' is denoted by <u>one of</u> p, not p, q, not q, r, not r.
Which of the following could be correct?

(a) (i) means $p \Rightarrow q$.	(ii) means (not q) $\wedge$ r.	(iii) means $q \Rightarrow$ (not r).
(b) (i) means $p \Rightarrow q$.	(ii) means $q \wedge r$.	(iii) means $q \Rightarrow$ r.
(c) (i) means (not p) $\Rightarrow q$.	(ii) means (not q) $\wedge$ r.	(iii) means (not r) $\Rightarrow q$.
(d) (i) means (not p) $\Rightarrow$ q	(ii) means $q \wedge r$.	(iii) means (not r) $\Rightarrow q$.
(e) (i) means $p \Rightarrow q$.	(ii) means $q \wedge r$.	(iii) means (not q) $\Rightarrow$ r.

15) Consider the following truth table.

p	q	$p \Rightarrow (p \wedge q)$
F	F	1
T	T	2
T	F	3
F	T	4

Truth values of cells labelled as 1,2 and 3 should be

(a) T,T,T respectively.	(b) T,T,F respectively.	(c) T,F,T respectively.
(d) F,T,T respectively.	(e) F,F,F respectively.	

16) Consider the following truth table.

p	q	r	β_1	β_2	β_3
T	T	T	T	T	T
T	F	T	T	T	T
F	T	T	T	T	T
F	F	T	T	T	T
T	T	F	T	F	F
T	F	F	F	T	T
F	T	F	T	T	F
F	F	F	F	T	F

Now, $p \Rightarrow (q \Rightarrow r)$ is one of β_1, β_2, β_3 and $(p \Rightarrow q) \Rightarrow r$ is also one of β_1, β_2, β_3.
Which of the following is/are correct?

(a) $p \Rightarrow (q \Rightarrow r)$ is β_2 and $(p \Rightarrow q) \Rightarrow r$ is β_1
(b) $p \Rightarrow (q \Rightarrow r)$ is β_1 and $(p \Rightarrow q) \Rightarrow r$ is β_2
(c) $p \Rightarrow (q \Rightarrow r)$ is β_2 and $(p \Rightarrow q) \Rightarrow r$ is β_3
(d) $p \Rightarrow (q \Rightarrow r)$ is β_3 and $(p \Rightarrow q) \Rightarrow r$ is β_1
(e) $p \Rightarrow (q \Rightarrow r)$ is β_1 and $(p \Rightarrow q) \Rightarrow r$ is β_3

17) Denote $((\text{not } p) \vee q \vee r) \wedge (p \vee (\text{not } q) \vee (\text{not } r)) \wedge (p \vee q \vee r)$ by β .
Which of the following are/is correct?

(a) β is true when p is false, q is false, r is true.
(b) β is true when p is true, q is true, r is true.
(c) β is true when p is false, q is true, r is true.
(d) β is true when p is true, q is false, r is false.
(e) β is true when p is true, q is true, r is false.

18) Out of the 16 possible sets of truth values for p, q, r, s,
$(p \wedge (\text{not } q) \wedge (\text{not } r) \wedge s) \vee (p \wedge q \wedge r \wedge (\text{not } s)) \vee (p \wedge q \wedge r \wedge s) \vee ((\text{not } p) \wedge q \wedge r \wedge s)$ is true for

(a) 15 sets of values.
(b) 8 sets of values.
(c) 4 sets of values.
(d) 6 sets of values.
(e) 2 sets of values.

19) Consider the following propositions.
(i) $p \wedge q$ (ii) $\text{not } (p \wedge q)$
(iii) $(\text{not } p) \wedge q$ (iv) $(\text{not } p) \vee (\text{not } q)$

Which of the following are/is correct?

(a) (i) and (ii) are equivalent.
(b) (iii) and (iv) are equivalent.
(c) (i) and (iii) are equivalent.
(d) (ii) and (iv) are equivalent.
(e) (i) and (iv) are equivalent.

20) It is given that $r \Rightarrow (p \vee q)$, $p \Rightarrow r$ and $q \Rightarrow r$ are true. Then which of the following must necessarily be true?

(a) r
(b) p
(c) $r \Rightarrow p$
(d) $p \Leftrightarrow r$
(e) $(p \vee q) \Leftrightarrow r$

21) For $n \in N$, P(n) is a proposition such that $P(1) \Rightarrow P(2)$ and, for any $n \in N \setminus \{1\}$,
$P(n) \Rightarrow P(n + 1)$ are true.
Which of the following are(is) true?

(a) For any $n \in N$, P(n)
(b) For any $n \in N$, $P(1) \Rightarrow P(n)$
(c) For any $n \in N$, $P(n) \Rightarrow P(n + 1)$
(d) For any $n \in N$, $P(2) \Rightarrow P(n)$
(e) $P(4) \Rightarrow P(6)$

22) Which of the following are/is correct?

(a) $(p \vee (\text{not } p)) \Rightarrow (p \wedge (\text{not } p))$ is a tautology.
(b) $p \vee \text{not } (p \wedge q)$ is a tautology.
(c) $p \vee \text{not } (p \wedge q)$ is a contradiction.
(d) $(p \wedge q) \wedge \text{not } (p \vee q)$ is a tautology.
(e) $(p \wedge q) \wedge \text{not } (p \vee q)$ is a contradiction.

23) Let S = {0,1,2} be the universal set. Which of the following are/is correct?

(a) $\exists x\, \forall y,\ x = y$ is true.	(b) $\exists x\, \forall y,\ x > y-1$ is true.
(c) $\forall x\, \forall y,\ x + y > 2$ is true.	(d) $\forall x\, \forall y,\ x + y < 5$ is true.
(e) $\exists y\, \forall x,\ x > y-1$ is true.	

24) A = {5, 7, 10}, B = {1, 5, 9}. Now consider the following:

(i) There is $y \in B$ such that for every $x \in A$, $x = y \vee (y < x < y + 4)$.

(ii) For any given $x \in A$, there is a corresponding $y \in B$ such that $x = y \vee (y < x < y + 4)$.

(iii) There is $x \in A$ and $y \in B$ such that $x + y > 12$.

Which of the following are/is correct?

(a) (i) is correct	(b) (ii) is correct	(c) (iii) is correct
(d) (i) is incorrect	(e) (ii) is incorrect	

25) Let A = {2,4,8,10} and B = {2,3,7,8}.
Which of the following are/is correct?

(a) $A \cap B = \phi$	(b) $A \cap B = \{2,8\}$
(c) $A \cap B = \{2,3,4,7,8,10\}$	(d) $A \cup B = \{2,3,4,7,8,10\}$
(e) $A \cup B = \{2,8\}$	

26) Let A be a non null set.
Which of the following are/is correct?

(a) $A \cap A = A$	(b) $A \cap \phi = A$	(c) $A \cap \phi = \phi$
(d) $A \cup \phi = A$	(e) $A \cup \phi = \phi$	

27) Let A, B and C be three non null sets.
Which of the following are/is correct?

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

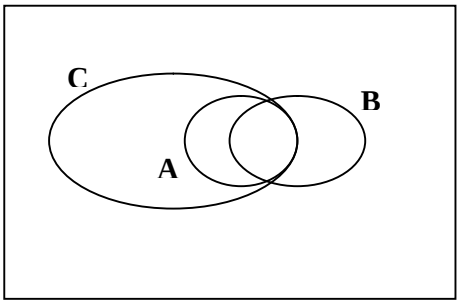
28) For any set X, P(X) denotes the set of all subsets of X. A, B are two sets such that $A \setminus B = \{-4, -1, 2, 6\}$ and P(B) is a subset of $\{\phi, \{2, 5, 7\}, \{2\}, \{5\}, \{7\}, \{2, 5\}, \{2, 7\}, \{5, 7\}\}$.
Which of the following are(is)true?

(a) A is a subset of {-4, -1, 2, 6}	(b) {-4, -1, 2, 6} is a subset of A
(c) A = {-4, -1, 2, 6}	(d) $B \neq \{2, 5, 7\}$
(e) A is a subset of {-4, -1, 2, 5, 6, 7}	

29) A, B are non null subsets of a universal set E and $C = (A \cup B)^c$ and $D = (A \cap B)^c$.
Which of the following are(is)correct?

(a) $C = A^c \cup B^c$ and $D = A^c \cap B^c$	(b) $C = A^c \cup B^c$ and $D = A^c \cap B^c$
(c) $C = A^c \cap B^c$ and $D = A^c \cup B^c$	(d) $C = A \cap B^c$ and $D = A \cup B^c$
(e) $C = A^c \cap B$ and $D = A^c \cup B$	

30) Consider the following Venn Diagram.



Now consider the following set of relationships.
(i) $A \cap B \cap C = A \cap B$
(ii) $A \cap B \cap C = B \cap C$
(iii) $A \cap B \cap C = A \cap C$
For the above Venn diagram, which one of the following are(is)correct?

(a) All of (i), (ii), (iii) are true	(b) Only (i) is true
(c) Only (ii) and (iii) are true	(d) Only (i) and (ii) are true
(e) Only (i) and (iii) are true	

31) Suppose there are two Urns with red, white and blue marbles. Urn I contains 5 red, 3 white and 2 blue marbles. Urn II contains 3 red and 7 blue marbles. A die to thrown to determine which urn to select and then a marble is drawn at random from the selected urn. If the die shows a "1" or "2", Urn I is selected, otherwise Urn II is selected. What is the probability of selecting a red marble?

(a) 5/30	(b) 6/30	(c) 8/10
(d) 5/10	(e) 11/30	

32) A family of five children is known to have at least two girls. What is the probability of this family having exactly four girls?

(a) 5/30	(b) 5/26	(c) 8/10
(d) 5/10	(e) 11/30	

33) It is observed that 60% people in a particular office read the newspaper A, 80% read the newspaper B and 50% read both newspapers A and B. If a person in this office is selected at random, what is the probability that he reads at least one of the two newspapers?

(a) 0.5	(b) 0.6	(c) 0.8
(d) 0.9	(e) 1	

34) A company has 3 telephone lines A, B and C. At any given time on a normal day, the phone A is busy 80% of the time, the phone B 50% of the time, and the phone C 90% of the time. If a customer picks a number of the company at random and dials, the probability that his call is immediately connected is

(a) 1/15	(b) 4/15	(c) 9/15
(d) 1/5	(e) 4/5	

35) Let A and B be two events with P(A) = $\frac{5}{9}$, P(B) = $\frac{3}{9}$, and P(A∩B) = $\frac{1}{9}$. Then, $P(A^c \cap B^c)$ =

(a) 1/9	(b) 2/9	(c) 3/9
(d) 5/9	(e) 8/9	

36) Let A={3,5,6}, B{2,4,7,8} and the relation ρ be defined as follows:

ρ={ (x,y)| x ∈ A, y ∈ B, x > y}.

Which of the following is/are correct about the elements of ρ?

(a) ρ= {(4,3),(7,3),(7,6),(8,6)}	(b) ρ= {(4,3),(7,3),(7,6),(8,3),(8,5),(8,6)}
(c) ρ= {(5,2),(5,4),(6,2),(6,4)}	(d) ρ= {(3,2),(5,2),(5,4),(6,2),(6,4)}
(e) ρ= ϕ	

37) Let ρ and σ be the two relations defined as follows:

ρ = { (1,4), (2,3), (7,9), (1,8), (3,3), (5,2) }
σ = { (4,4), (3,10), (8,12), (8,5), (8,8), (15,2), (14,8) }
which of the following is/are correct about the composition of ρ and σ?

(a) σ o ρ = { (1,4), (2,10), (1,12), (1, 8), (1,5), (3,10) }
(b) ρ o σ = { (8,2), (15,3) }
(c) σ o ρ = { (8,2), (15,3) }
(d) ρ o σ = { (1,4), (2,10), (1,12), (1, 8), (1,5), (3,10) }
(e) σ o ρ = ρ o σ

38) Let A={2,4}, B={3,5} and C={3,9,11} be three sets. Which of the following is/are correct?

(a) A x B = {(2,3),(4,5)}
(b) A x (B ∩ C) = {(2,3),(4,3)}
(c) B x A = {(3,2),(3,4),(5,2),(5,4)}
(d) (B ∩ C) x (A ∪ B) = {(3,2),(3,3),(3,4),(3,5)}
(e) C x (A ∩ B) = (A ∩ C) x B

39) Let A={2,4,6} and the relation $\boldsymbol{\rho}$={(2,2), (2,4), (4,4), (4,2),(6,4),(4,6),(6,6)}. Which of the following relations defined on A is/are equivalence relation(s)?

(a) ρ ={(2,2), (4,4), (6,6)}
(b) ρ ={(2,2), (4,4), (6,6), (2,4), (4,2)}
(c) ρ ={(2,2), (4,4), (6,6), (2,4), (4,6), (2,6)}
(d) ρ ={(2,4), (4,6), (2,6), (4,2),(6,4), (6,2)}
(e) ρ ={(2,2), (4,4), (6,6), (2,4), (4,6), (2,6), (4,2),(6,4), (6,2)}.

40) Suppose an equivalence relation ρ defined on A={1,2,3,4} is given as

ρ={ (1,1), (2,2), (3,3), (4,4), (1,2), (2,1), (2,3), (3,2), (1,3), (3,1) }

Which of the following is/are true about the equivalence classes in A?

(a) $[1]_\rho=\{1,2,3\}$	(b) $[1]_\rho=\{1,2,3,4\}$	(c) $[1]_\rho=[2]_\rho=[3]_\rho=\{1,2,3\}$
(d) $[4]_\rho=\{4\}$	(e) $[3]_\rho=[1]_\rho=\{3,1\}$	

41) Given a relation f, which of the following relations is/are function(s)?

(a) D(f)={1,2,3}, f(1)=4, f(2)=5, f(3)=10
(b) D(f)={1,2,3}, f(1)=4, f(2)=4, f(3)=5
(c) D(f)={1,2,3}, f(1)=4, f(2)=4, f(3)=4
(d) D(f)={1,2,3}, f(1)=4, f(1)=4, f(2)=5, f(3)=5
(e) D(f)={1,2,3}, f(1)=4, f(2)=4, f(3)=4

42) Suppose the function f is defined such that D(f)={a,b,c}, f(a)=1, f(b)=2, f(c)=3. Find R(f) and graph(f).

(a) R(f)={1,2,3}, graph(f)={(1,a),(2,b),(3,c)}
(b) R(f)={1,2,3}, graph(f)={(a,1),(b,2),(c,3)}
(c) R(f) = {x| $\exists$y, y ε D(f) , x = f(y) }, graph(f)={(x,y)| x $\in$ D(f), f(x)=y}
(d) R(f) = {y| $\exists$x, x ε D(f) , y = f(x) }, graph(f)={(y,x)| x $\in$ D(f), f(x)=y}
(e) R(f) = {y| $\exists$x, x ε D(f) , y = f(x) }, graph(f)={(x,y)| x $\in$ D(f), f(x)=y}

43) If g is a 1-1 function,which of the following is/are correct ?

(a) $\forall x \forall y\ x \in D(g), y \in D(g), x \neq y \Rightarrow g^{-1}(x) = g^{-1}(y)$
(b) $\forall x \forall y\ x \in D(g), y \in D(g), x \neq y \Rightarrow g^{-1}(x) \neq g^{-1}(y)$
(c) $\forall x \forall y\ x \in D(g), y \in D(g), x \neq y \Rightarrow g(x) \neq g(y)$
(d) $\forall x \forall y\ x \in D(g), y \in D(g), g(x) = g(y) \Rightarrow x = y$
(e) $\forall x \forall y\ x \in D(g^{-1}), y \in D(g^{-1}), x \neq y \Rightarrow g^{-1}(x) = g^{-1}(y)$

44) Let A and B be two non-empty sets. Suppose the function h is 1-1 and h maps A onto B. Which of the following is/are correct?

(a) D(h)=A and R(h) $\subseteq$ B	(b) h^{-1} maps B into A
(c) D(h)=A and R(h) = B	(d) D(h)=A and R(h) = B
(e) h^{-1} maps B onto A	

45) Let the 6-tuple <B,+,*, ',0,1> be a Boolean algebra where B be a set, + and * the sum and the product operators respectively, 0 and 1 the zero and the unit elements respectively and ' the complement operator.
If a,b,c are elements of the set B, which of the following is/are correct?

(a) a + a = 0	(b) a x a' = 0	(c) a + a' = 0
(d) a x b + a x b' = b	(e) a x b + a x b' = a	

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