UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF INFORMATION TECHNOLOGY

FINAL EXAMINATION
JANUARY 2016 SEMESTER

COURSE CODE	:	IGB 10403
COURSE NAME	:	DISCRETE MATHEMATICS FOR IT
PROGRAMME LEVEL	:	BACHELOR
DATE	:	23 MAY 2016
TIME	:	2.00 pm – 4.30 pm
DURATION	:	2 1/2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of seven (7) questions. Answer ALL questions.
4. Please write your answers on the answer booklet provided.
5. Please write your answer using PEN.
6. Formulas are appended for your reference.

INSTRUCTION: Answer all questions

Please use the answer booklet provided.

SECTION A (40 MARKS)

1. p : 2 + 2 = 4
   q : 2 + 3 = 4
   r : 0 > 1

   Express each of these propositions as an English sentence.

   i. $p \oplus q$

   (1 mark)

   ii. $q \rightarrow \neg p$

   (1 mark)

   iii. $r \leftrightarrow p$

   (1 mark)

   iv. $(p \wedge q) \vee \neg q$

   (1 mark)

2. Prove the following statement by using direct proof:

   "The product of any two rational numbers are rational"

   (10 marks)

3. Let A = { 1, 2, 3, 4, 5} and B = {0, 3, 6}. Determine

   i. $|P(B)|$

   (2 marks)

   ii. A - B

   (2 marks)

   iii. improper subsets of A

   (2 marks)

   iv. (A $\cap$ B) $\cup$ B

   (2 marks)

4. Prove the statement $\neg(\neg k \wedge s) \wedge (k \vee s)$ by using the *Law of Logic*

(6 marks)

5. Let f(k) = 2k +5 and g(k) = 3k – 2, determine

   i. (f + g)(k)

   (2 marks)

   ii. (f ∘ g)(-1)

   (4 marks)

   iii. (g · f)(k)

   (2 marks)

6. i. Convert decimal 200 to a number in binary.

   (2 marks)

   ii. By using your answer in **part (i)** or any other methods, express 200 in octal.

   (2 marks)

SECTION B (60 MARKS)

QUESTION 1

Here is an example using integers. Someone discovered a formula that seems to work for the sum of the integers:

$$6 + 12 + 18 + \ldots 6n = \frac{6n(n+1)}{2}$$

He could check lots of cases, but no matter how long he worked, he could never check that the formula holds for every integer greater than 1. With mathematical induction, you can help him to solve his problem.

a) For the smallest $n = 1$

(2 marks)

b) When $n = k$

(1 mark)

c) When $n = (k+1)$

(9 marks)

QUESTION 2

a) Draw Venn diagrams and shade the region of the notation below:

$A' \cup B'$

(2 marks)

b) In a survey of 120 passengers, an airline found 48 enjoyed *juice* with their meals, 78 enjoyed *mixed drinks* and 66 enjoyed *iced tea*. In addition, 12 enjoyed each pair of these 3 beverages and 24 passengers enjoyed them all. Draw a Venn diagram to illustrate the information above and fill all the regions.

(8 marks)

QUESTION 3

a) A hot balloon rises vertically from the ground so that its height after *t* second(s) is

$$h = \frac{1}{2}t^2 + \frac{1}{2}$$

i. Determine the inverse of function $f(t) = \frac{1}{2}t^2 + \frac{1}{2}$

(4 marks)

ii. Use the result in **part (i)** to determine the time when the balloon is between an altitude 120*ft*.

(4 marks)

b) Given ;

G = { (1 , b), (2 , c), (3 , a) } is a function from X = { 1, 2, 3 } to Y = { a, b, c, d }

and

F = { (a , x), (b , x), (c , z), (d , w)} a function from Y to Z = { w , x , y , z }

i. Draw the arrow diagram of (f ∘ g)

(4 marks)

ii. Write (f ∘ g) as a set of ordered pairs.

(1 mark)

QUESTION 4

a) Determine the greatest common divisor of 414 and 662 by using the Euclidean algorithm.

(6 marks)

b) A florist has 36 roses, 27 tulips, and 18 carnations she must use to create bouquets. Calculate what is the largest number of bouquets she can make without having any flowers left over. (Hint find GCD to the given numbers)

(4 marks)

c) One trip around a running track is 440 yards. One jogger can complete one lap in 8 minutes, another jogger can complete it in 6 minutes. Calculate how long will it take for both joggers to arrive at their starting point together if they start at the same time and maintain their jogging pace. (Hint find LCM to the given numbers)

(3 marks)

QUESTION 5

a) Given that p : Rita is baking a cake
q : She is practising her flute
r : Rita's father will buy her a car

- This is not the case that her father will not buy her a car or she is baking a cake if and only if she is practicing her flute.
- Either Rita is baking a cake or she is not practicing her flute if and only if her father will buy her a car.

Convert the two given arguments into symbolic form and determine whether they are logically equivalent or not.

(12 marks)

MALAYSIA INSTITUTE OF INFORMATION TECHNOLOGY

FINAL EXAMINATION

SUBJECT CODE : IGB 10403
SUBJECT TITLE : DESCRETE MATHEMATICS FOR IT
LEVEL : BACHELOR

Law of Double Negation	$\neg\neg p \Leftrightarrow p$
De Morgan's Laws	$\neg(p \vee q) \Leftrightarrow \neg p \wedge \neg q$ $\neg(p \wedge q) \Leftrightarrow \neg p \vee \neg q$
Commutative Laws	$p \vee q \Leftrightarrow q \vee p$ $p \wedge q \Leftrightarrow q \wedge p$
Associative Laws	$(p \wedge q) \wedge r \Leftrightarrow p \wedge (q \wedge r)$ $(p \vee q) \vee r \Leftrightarrow p \vee (q \vee r)$
Idempotent Laws	$p \vee p \Leftrightarrow p$ $p \wedge p \Leftrightarrow p$
Negation Laws	$p \vee \neg p \Leftrightarrow t$ $q \wedge \neg q \Leftrightarrow c$
Identity Laws	$p \vee c \Leftrightarrow p$ $p \wedge t \Leftrightarrow p$
Distributive Laws	$p \wedge (q \vee r) \Leftrightarrow (p \wedge q) \vee (p \wedge r)$ $p \vee (q \wedge r) \Leftrightarrow (p \vee q) \wedge (p \vee r)$