UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2010/2011

COURSE NAME	:	DISCRETE STRUCTURE
COURSE CODE	:	BIT 1113 / BIT 11103
PROGRAMME	:	BACHELOR OF INFORMATION TECHNOLOGY
EXAMINATION DATE	:	APRIL/MAY 2011
DURATION	:	2 ½ HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY.

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

Q1 (a) Show that $\sim(p \wedge q) \equiv \sim p \vee \sim q$, where p and q are propositions.

(3 marks)

(b) Use De Morgan's law to show that $p \to q \equiv \sim q \to \sim p$.

(3 marks)

(c) Find the converse, opposite, and contrapositive of the implication: "If I scored in the examination, then I have RM1000 rewards"

(4 marks)

Q2 (a) List the elements of these sets, where *n* is of type integer.

cos $\frac{n\pi}{2}$ cos $\frac{n}{2} \cdot \pi$ ✓

(i) $\{n - 5 \mid n \text{ divides } 24\}$.

(ii) $\{\cos \frac{n}{2}\pi \mid 1 < n \leq 6,\ \pi = 180^0\}$.

(4 marks)

(b) Let $A = \{student_i \mid student_i \in \text{Table 1, and } i = 1,2,3\}$, and $B = \{sub_i \mid sub_i \in \text{Table 1}, i=1,2,3,4\}$

Table 1 : Students vs Subjects

	Sub_1	Sub_2	Sub_3	Sub_4
$student_1$	85	90	72	68
$student_2$	78	89	90	57
$student_3$	80	85	68	75

Find, $A \times B$ for $(a_i, b_j) > 80$. From **Table 1**, where $a_i \in A$ and $b_j \in B$, $i=1,2,3$ and $j = 1,2,3,4$.

(3 marks)

(c) What is the power set of the set $\{v, w, x, y, z\}$?

No problem with the question.

(3 marks)

Q3 (a) Let $\mathbf{Z}$ be the set of integers and $m \in \mathbf{Z}$. Let $\mathbf{R}$ be the relation on $\mathbf{Z}$ defined by $a\mathbf{R}b$ if $a-b$ is a multiple of m. Show that $\mathbf{R}$ is an equivalence relation on $\mathbf{Z}$.

(5 marks)

(b) Given an equivalent relation,

$\mathbf{R} = \{(1,1), (1,3), (1,5), (2,2), (2,4), (3,1), (3,3), (3,5), (4,2), (4,4), (5,5), (5,1), (5,3), (6,6), (6,7), (7,1), (7,3), (7,5)\}$,

on $X = \{1,2,3,4,5,6,7\}$.

The equivalent class $[1]$ containing 1 consists of all x such that $(1,x) \in \mathbf{R}$. Find the partition of $\mathbf{R}$?

(5 marks)

Q4 (a) Solve the recurrence relation $T(n)=T(n/2)+\log(n)$ where $T(1)=1$, $n=2^k$ and k is a non-negative integer.

(5 marks)

(b) What is the solution of the recurrence relation $a_{n+2}-8a_{n+1}+16a_n=0$ with initial condition $a_0=5$ and $a_1=16$.

(5 marks)

Q5 (a) Let $A=\{a \mid 1<a<6, \ a\in N\}$. If we define a relation H on A such that $(a,b)\in H$ if $a\geq b+1$, $a,b\in A$.

(i) Obtain H.

(ii) Draw the digraph for H.

(iii)What is the in-degrees and out-degrees of all vertices.

(5 marks)

(b) Consider the following weighted graph G. From **Figure Q5(b)**, apply Djikstra's algorithm from vertex v_0 to vertex v_5.

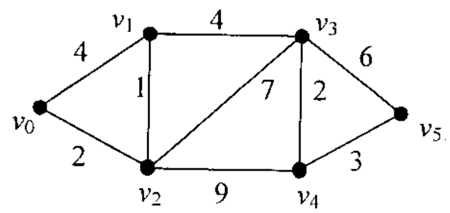

Figure Q5(b)

(5 marks)