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MATH212 : Discrete Mathematics — **Med.Term Exam Tu. 26/03/2024**

Time : 70 Minutes — الرقم الجامعي — اسم الطالب :

Question1: ***Answer with TRUE or FALSE, justify your answers:*** **(4 M)**

a) If 30 is divisible by 5 then 40 is divisible by 6.

b) The proposition $\neg(\forall x P(x))$ is the same as $\neg \exists x$ such that (P(x))

c) If the logical proposition $P(x)$ is given by $(x^2 = 4) \rightarrow (x \leq 1)$. Then $P(3)$ is true.

a) If the domain consists of all integers, then $\forall n\ (n^2 \geq n)$

Question 2 : ***Given the following compound propositions:*** **(5+1 M)**

a) $P \vee (Q \wedge R)$ b) $P \rightarrow (\neg Q \vee R)$

1. **Construct a truth table for the compound propositions a and b.**
2. **Are the compound propositions a and b logically equivalent?**

P	Q	R					
T	T	T					
T	T	F					
T	F	T					
T	F	F					
F	T	T					
F	T	F					
F	F	T					
F	F	F					

Question 3: **(3 M)**

Construct a combinatorial circuit using inverters, OR and AND gates that produces the output $(P \vee \neg R) \vee (P \vee \neg R) \wedge Q$ from the input bits P, Q and R.

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Question 4: (4 M)

Let P and Q be predicates defined as follows: P(x) : x is even number and Q(x) : x an odd number , Write each of the following predicates in symbolic form: (using Predicate quantifiers)

a) There is an even number.

b) No number is either even or odd.

c) No number is both even and odd.

d) The sum of two even numbers is odd.

Question 5: ***If n and m are odd integers then (n + m) is even integer.*** (4 M)

Question 6: ***Give a contrapositive proof of the:*** (4 M)

If $x^2 - 6x + 5$ is even, then x is odd. $x \in Z$.

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