University of Bahrain
College of Science
Department of Mathematics
Second Semester 2012/2013

Course: MATHS 253
Test 1
Date: 09/04/2013
Time: 8:00-9:00

Name:
.....

ID Number: ..... Serial No..... Section No:.....

Make sure your exam has 3 different questions and 4 pages including the front page.

Question	Maximum Marks	Marks Obtained
1	8	
2	8	
3	9	
Total	25	

All work should be shown clearly

Question 1 : [4+4 marks]

1) Prove the conclusion from the set of premises in the following

Premises: $R,\ P \Longrightarrow Q,\ S,\ \neg P \wedge R \wedge S \Longrightarrow T$
Conclusion: $\neg Q \Longrightarrow T \vee R$

2) Give a counterexample to show that $(\neg P \wedge Q \Longrightarrow R) \Leftrightarrow (P \vee Q) \vee R$ is not a tautology.

Question 2 : [4+4 marks]

1) Let x, y, z be real numbers. Use a proof by contradiction to prove the statement: If $xz < yz$ and $z < 0$, then $x > y$.

2) Let m and n be two nonnegative integers. Use a direct proof to prove that If $n < 3$ and $m < 9$ then $mn^2 < 81$.

Question 3 : [5+4 marks]

Prove each of the following

1) If x is an integer then $x(x^2 + 1)$ is even

2) $\frac{1}{1.2} + \frac{1}{2.3} + \cdots + \frac{1}{n(n+1)} = \frac{n}{n+1}$, for $n = 1,2, \ldots$