



SCHOOL OF SCIENCE, ENGINEERING & HEALTH
DEPARTMENT OF SCIENCE AND ENGINEERING
END OF SEMESTER EXAMINATION

MAT 102 A – T: BASIC MATHEMATICS
JANUARY SEMESTER 2012

Time: 2 Hours

TOTAL MARKS: 60

Instructions:

Answer questions one and any other two.

QUESTION ONE (COMPULSORY-24 MARKS)

- a. Let p , q and r be statements while T and F represent the truth values True and False respectively. Fill in the following table. **3 marks**

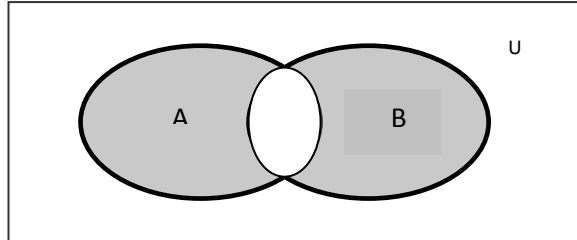
p	q	r	$p \wedge r$	$p \rightarrow q$	$p \vee r$	$p \leftrightarrow q$	$\neg p$
T	F		T	F		T	
T		F	F	T			F

- b. Specify the following sets by word description:-
- i. $\{1, 2, 3, 4, 5, \dots\}$ **1 mark**
 - ii. $\{12, 14, 16, \dots, 96\}$ **1 mark**
- c. Define the following terms:-
- i. Tautology **1 mark**
 - ii. Cardinality **1 mark**
- d. Convert the following decimals into fractions:-
- i. $0.3\overline{7}$ **1 mark**
 - ii. $1.13382382382382\dots$ **2 marks**
- e. Determine if the following statements are true or false.
- i. If $5+10=16$ then $15-13=3$ **1 mark**
 - ii. $1+1=2$ or dead people can cheat in exams **1 mark**
 - iii. $111+11=122$ and I am created in God's image. **1 mark**
- f. Factorize the $8x^2 - 34x + 21$ **3 marks**
- g. Find the LCM and also GCD of the following numbers, 1848 and 935 **3 marks**
- h. Find an equation of the line that passes through the point (2,-1) and is parallel to the line $2x - 3y = 5$. **5 marks**

QUESTION TWO – 18 MARKS

- a). Distinguish between the subsets and proper subset 2 marks
b). If $A = \{x \mid x^2 - 4 = 0\}$ Find all the elements of A 3 marks
c). Which of the following sets describe the shaded region of the Venn diagram below? 3 marks

- i). $A \cap B$
ii). $A \cup B$
iii). $A \oplus B$
iv). $A^c \cap B^c$



- d). A survey of 1200 college students reveals that

$\frac{1}{2}$ have a profile on MySpace,
 $\frac{5}{12}$ have a profile on Facebook
 $\frac{1}{3}$ have a profile on Twitter,
 $\frac{1}{24}$ have profile on the three sites,
 $\frac{1}{8}$ have a profile on both MySpace and Twitter,
 $\frac{1}{12}$ have on both Twitter and Facebook and
 $\frac{1}{4}$ have profile on both Facebook and MySpace.

- i). How many students have a profile on MySpace only
ii). How many students have a profile on Facebook only
iii). How many students have a profile on exactly two sites
iv). How many students have a profile on Twitter and Facebook but not on MySpace
v). How many students have no profile on any of the three sites

10 marks

QUESTION THREE – 18 MARKS

- a. By constructing a truth table, determine when the statements

$$\neg(p \wedge q) \wedge [(p \vee q) \wedge q] \text{ is true.}$$

4 marks

- b. Show that $(p \rightarrow q) \rightarrow \neg(p \wedge \neg q)$.

4 marks

- c. Write the negation of the following statements:-

- i. Not all smart people attend college 1 mark
ii. All birds have feathers 1 mark
iii. Some apples are rotten 1 mark

- d. Determine if the following argument is valid or not.

If you climb the highest mountain, then you will feel great. If you feel great, then you are happy. Therefore, since you haven't climbed the highest mountain, then you are not happy.

7 marks

QUESTION FOUR – 18 MARKS

- a. Identify the property of real numbers demonstrated by each of the following operations:-

- i. $2 + 3 = 3 + 2$ **1 mark**
- ii. $2(4 + 6) = 2(4) + 2(6)$ **1 mark**
- iii. $(6 + 9) + 10 = 6 + (9 + 10)$ **1 mark**
- iv. $7 \times \frac{1}{7} = 1$ **1 mark**

- b. Perform the indicated operations and leave your answers as fractions in lowest terms.

- i. $\frac{-3 + \sqrt{3^2 + 4(2)(3)}}{2 \times 2}$ **2 marks**
- ii. $\frac{-7}{9} \cdot \frac{99}{174} + \frac{-7}{9} \cdot \frac{75}{174}$ **2 marks**
- iii. $\frac{7}{30} + \frac{42}{5} - \frac{5}{99}$ **1 mark**

- c. Carry out the following operations (or simplify where necessary).

- i. $\sqrt{\frac{2}{5}}$ **2 marks**
- ii. $\sqrt{(x + y)^2}$ **2 marks**
- iii. $\sqrt{400} + \sqrt{32}$ **2 marks**

- d. What are the least common multiple and the greatest common divisor of 1011 and 2403? **3 marks**

QUESTION FIVE – 18 MARKS

- a) Solve the inequality and graph it $|x - 2| \geq 4$ **3 Marks**
- b) Solve for x in the equation $3x^2 - 8x + 2 = 0$ **3 Marks**
Find the point of intersection of the lines $2x + 3y = 7$ and $-x + y = 4$. **4 Marks**
- c) Write the negation of each of the statement
 - i). I got an A or I got an B **2 marks**
 - ii). All dogs have fleas **2 Marks**
- d) The length of a floor is $2m$ longer than the width and the area is $80m^2$. Find the dimensions of the room and hence the perimeter of the floor. **4 marks**