

**W1-2-60-1-6**

**JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2016/2017**

**FIRST YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY**

**SMA 2100: DISCRETE MATHEMATICS**

**DATE: NOVEMBER, 2016 TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER**

 **TWO QUESTIONS**

 **QUESTION ONE: 30 MARKS**

a. Define the following terms as used in discrete moths:-

 i. Propositional statement.

 ii. A set.

 iii. Logic.

 iv. Disjoint set.

b. Write each of the following as a conditional statement:- [3 marks]

i. One can pass this course only if one studies.

ii. A necessary condition for a person to vote is that, that person be registered.

iii. A sufficient condition for water to be salty is that it be taken from the pacific ocean.

c. Determine the domain and range of the following functions:-

 i. y = x2+x-2 [3 marks]

 x2-x-2

ii.

 64-x2 [2 marks]

d. Given that f(x)=10x and g(x)=x+3,

Find fg(x) and (fg)-1x [3 marks]

 e. Given that A=(0,1,2,3,4,5) and

 B=(1,3,5,7,9,), Find the following:-

 i. AVB

 ii. ANB

 iii. A-B

 iv. B-A

 v. ADB [7 marks]

f. Probably inductions that:-

 12+22+32 +….+n2=n(n+1) (2n+1) [6 marks]

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g. Construct a truth table for the proposition

 P$Λ$2q [2 marks]

 **QUESTION TWO: 20 MARKS**

a. p is “the printer is off-line”

 q is “the printer is out of paper”

 r is “ the document has finished printing”

 Write as English sentences as in a natural way as you can:

 (i) p$⋁$q (ii) r$ Λ$ q (iii) q $Λ$ $ℸ$ r (iv) 7(P$⋁$q) [8 marks]

b. Prove by contradiction that$\sqrt{2}$ is an irrational number. [4 marks]

c. Construct truth tables for:-

 i. p$⋁$ ( q $Λ$ r)

 ii. (p$⋁q$ ) $Λ$ (p $⋁$r)

 and hence show that there propositions are logically equivalent.

 [8 marks]

**QUESTION THREE:20 MARKS**

a. Define p,$q$ and r as : p: mathematics is easy

 q: mathematics in fun

 r: mathematics is useful

 Write in reasonable English, the proposition represented by:- [7 marks]

 i) p$Λq$ ii) PVq iii) (PVq) iv) (P$Λ$q)$ Λ$ r

 v)np r vi) (p$Λ$ q) vii)q (p $Λ$r)

b. Given u=(1,2,3,4,5,6,7,8,9,10)

 A=(1,5,7,10) B=(5,6,8,10) and C=(4,6,8)

 List the elements in the sets: [13 marks]

 i)AnB ii)BnC iii)Ann(BnC) iv) (AvB)VC

 v) B vi)(AnB)v(BnC) vii)AnB viii)ADB

**QUESTION FOUR: 20 MARKS**

a. If f (y) = 1 and g(x)=2x-1, h1x)=x2x4x-2,

 x42,

 Find:-

 i) (fog)(x) ii)gvf)(x) iii)(hog)(x) iv)(goh)(x) [10 marks]

b. Given that f(x)= x2+2 and g(x)= $\sqrt{23-x}$ ,

 Find:-

 i. The composite function (gof)(x) and its domain.

 ii. The composite function (fog)(x) and its domain. [6 marks]

c. Define the following two statement and give their equivalent truth tables:-

 i.

 ii. Contradiction [4 marks]

**QUESTION FIVE: 20 MARKS**

a. Let f(x)=2x2 + x+5 and g(x)=3x2+2XY, find the following:-

 i) Domain of f ii) Domain of g iii) (f+g)(x)

iv) Domain of (f+g)(x) v) (f-g)(x) vi) Domain of f.g(x)

vii) f/g(x) viii) Domain of f/g(x) [18 marks]

b. Explain the following terms:-

 i. Predicate ii. Injection iii. Surjection

 iv. Bijection [14 marks]