UNIVERSITY OF NAIROBI

UNIVERSITY EXAMINATIONS 2014/2015

FIRST YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF ARTS IN ICT

ICS 115 DISCRETE MATHEMATICS Date: Wed. Apr. 22, 2015 Time: 9am – 11am

Answer Question one and any other two Questions

QUESTION I (30 MARKS)

(a ) Find the characteristic equation and the form of solution of the recurrence relation

[5]

(b) Solve: (i) |x-3| > 1;  (ii) |2x+3| <1. solution. -2<x<-1 Ans [5]

(c)… Find the number of positive integers less than 21 that are relatively prime to 21[5]

(d) Simplify then give the truth table of the following:  =  [5]

(e) Given A = {1,2,3,4}, R={(1,1),(1,2),(1,3),(1,4),(2,2),(2,4), (3,2),(3,3),(3,4), (4,2), (4,4)}; (i) give for (A,R), the adjacency matrix, and the diagraph.

=M; 

(ii) An equivalence relation is reflexive, symmetric, and transitive relation. (A, R) is reflexive, not symmetric because there exist (1,3) but (3,1) does not exist. It is therefore not an equivalence relation on (A,R). [5]

(f) Transform the Boolean expression into disjunctive normal form, hence give its dual:

x’(xy’+ yx’ + y’z)’= [5]

QUESTION II (10 MARKS)

(a) State the mathematical inductive assumption, hence demonstrate by mathematical induction that

5]

(c) Simplify then give the truth table of the following:

[5]

QUESTION III (10 MARKS)

(a) Given that A = {a, b, c}, R = {(a, a), (a, c), (b, a), (a, b), (b, b), (b, c), (c, a), (c, c)} determine the adjacency matrix and the diagraph of (A, R). Determine whether (A, R) is an equivalence relation; a poset.

  It is not symmetric because (b,c) exist but not (c,b). It is therefore not an equivalence relation. There exist (c,a) and (a,b) but not (c,b), hence not transitive, hence not a poset. [5].

(b. For integers a and b ;  partition the set of integers into four disjoint sets. {[0], [1], [2], and [3]} Each partition satisfy reflexive, symmetric and transitive relations. Hence equivalence relation. Each partition does not satisfy antisymmetry. In each exist (-a,a) such that and  but  . Hence not a poset. [5]

QUESTION IV (10 MARKS)

1. For a finite nonempty school of sets  [3]

(b) (i) A Lattice is a poset in which for every pair of elements x, and y, there exist x meet y, and x join y.  is a lattice, bounded by 21 and 1 ; every element is complemented, and it is distributive; (iii) Its Hasse Diagram.  [3]

(c ) Find n if (i) 

(ii)  (4 marks [4]

QUESTION V (10 MARKS)

(a).A Boolean Algebra is a lattice with two elements, I and o, or 1 and 0. It is distributive, complemented, and bounded. y(x’z)’ + y’z + x’ (x y’ + z)  =

.xyz+xyz’+x’yz’+xy’z+x’y’z+x’yz+x’y’z = xyz + xyz’ +xy’z +x’yz + x’yz’ +x’y’z =Sn

S\* = (x+y+z)(x+y+z’)(x+y’+z)(x’+y+z)(x’+y+z’)(x’+y’+z) Ans [3]

(b). The solution of the recurrence relation [4]

(c ) ) For integers a and b ; show that  partition the set of integers into two disjoint sets. Each partition satisfy equivalence relation and not a partial ordering relation with respect to (mod 2) concept; e.g. In each, are  and  . antisymmetry fails because –a is different from a. [3]