B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2010

Fifth Semester

Computer Science and Engineering

MA 2265 — DISCRETE MATHEMATICS

(Regulation 2008)

Time : Three hours Maximum : 100 Marks

Answer ALL questions

PART A — (10 × 2 = 20 Marks)

1. When do you say that two compound propositions are equivalent?

2. Prove that p, p ? q, q ? r ? r .

3. State Pigeonhole principle.

4. Find the recurrence relation satisfying the equation n n

n y = A(3) + B(?4) .

5. Define strongly connected graph.

6. State the necessary and sufficient conditions for the existence of an Eulerian

path in a connected graph.

7. State any two properties of a group.

8. Define a commutative ring.

9. Define Boolean algebra.

10. Define sub-lattice.

PART B — (5 × 16 = 80 Marks)

11. (a) (i) Prove that the premises a ? (b ? c) , d ? (b ? c) and (a ? d)

are inconsistent. (8)

(ii) Obtain the principal disjunctive normal form and principal

conjunctive form of the statement p ? (p? (q ? (q ? r))). (8)

Or

(b) (i) Prove that

?x(P(x) ? Q(x)), ?x(R(x) ? Q(x)) ? ?x(R(x) ? P(x)). (8)

(ii) Without using the truth table, prove that

p ? (q ? r) ? q ? (p ? r). (8)

12. (a) (i) Prove, by mathematical induction, that for all n ? 1 , n 2n 3 + is a

multiple of 3. (8)

(ii) Using the generating function, solve the difference equation

6 0 2 1 ? ? = n + n + n y y y , 1, 1 y = 2 0 y = . (8)

Or

(b) (i) How many positive integers n can be formed using the digits

3, 4, 4, 5, 5, 6, 7 if n has to exceed 5000000? (8)

(ii) Find the number of integers between 1 and 250 both inclusive that

are divisible by any of the integers 2, 3, 5, 7. (8)

13. (a) (i) Draw the complete graph 5 K with vertices A, B,C, D, E . Draw all

complete sub graph of 5 K with 4 vertices. (8)

(ii) If all the vertices of an undirected graph are each of degree k , show

that the number of edges of the graph is a multiple of k . (8)

Or

(b) (i) Draw the graph with 5 vertices, A, B,C, D, E such that

deg (A) = 3 , B is an odd vertex, deg (C) = 2 and D and E are

adjacent. (8)

(ii) The adjacency matrices of two pairs of graph as given below.

Examine the isomorphism of G and H by finding a permutation

matrix.

B.E./B.Tech DEGREE EXAMINATION, M AY/JUNE2 007.

Fifth Semester

(Regulation 2004)

Computer Science and Engineering

MA 1256 - DISCRETE MATHEMATICS

(Common to B.E. (Part-Time) Fourth Semester Regulation 2005)

Time : Three hours Maximum: 100 marks

Answer ALL questions.

PART A - (10 x2 = 20 marks)

1. Express the statement "Good food is not cheap" in symbolic form.

2. ObtainPDNFfor -PvQ.

3. Define simple statement function.

4. Express the statement "For every'x'there exist a'y'such that x2 +y'>L00"

in s;'rnbolic form.

5. Give an example of a relation which is symmetric, transitive but not reflexive

on { a , b , c } .

6. Define partially ordered set.

7. If A has 3 elements and B has 2 elements, how many functions are there from

Ato B.

8. Define Characteristic function.

9. Give an example of sub semi-group.

10. Define normal subgroup of a group.

PARTB-(5x16=80marks)

11. (a) (i)

Without using truth tables, show that Q v (Pn - Q)" G P n - is a tautology.Obtain the PDNF for

(P" Q)r (- P" Q)" (Q"/?).

Or

Show that S is valid inference from the premises

P->-Q,QuR,-S+P and-R.

Without using truth tables, show that

(- P"(- I n E))' (Q nrB)v (P nB) <+.R .

a)(B)

(8)

(8)

premises

(8)

(b) (i)

12. (a) (i)

(ii)

(ii)

(8)

(8)

(ii)

Show that

(x)(P(x) -+ 8("))n (r)(Q(r)--+ R(r)) > (x)(P(x) + fi(r))

Is the following conclusion validly derivable from the

given?

If (vr)(P(r)- Q(")), (=y)P(y) t]nen (=z\P(z)

Or

(b) (i) Verify the validity of the inference. If one person is more successful than another, then he has worked harder to deserve success.

John has not worked harder than Peter. Therefore. John is not

successful than Peter. (8)

13. (a) (i)

Show that R v S is a valid conclusion from the premises

CvD,(CvD)4-H, -H -->(A " -B) and (A"-B)- (ftvS) f g l

A survey of 500 television watchers produced the following

information: 285 watch foot ball games; 195 watch hockey games:

115 watch Basket ball games: 45 watch foot ball and basket ball

games: 70 watch foot ball and hockey games: 50 watch hockey and

basket ball games: 50 do not watch any of the three games: How

many people watch exactly one of the three games.

(ii) In a Booiean algebra Z prove that

I

(a nb) = a' v b' fot all a,b e L.

(8)

(ii)

(8)

Or

(b) (i)

(ii)

(ii)

Let the relation R be defined on the set of a1l real numbers by

'if x,y are real numbers, xRy ex y is a rational numbers'.

Show that R is an equivalencer elation. (8)

Draw the Hasse Diagram of the Lattice L of all subsets of {a,b,c}

under intersection and union, (8)

74. (a) (i)

Or

ft) (i) Let f :R-+R bedefinedbV f(*)=2x-3. Findaformula for f-l .

(8)

(ii) Show that A n(B u C)= (AnB)u (A ac)by using characteristic

function. (8)

15. (a) (i) Show that the mapping g from the algebraic system (S, +) to the

system (T,n defined by g(")=3o, where S is the set all rational

numbers under addition + and ? is the set of non-zero real numbers

under multiplication operation X, is a homomorphism but not an

isomorphism. (8)

(ii) Show that (2, 5) encoding function defined by e(00)= 00000,

e(0t)= 01110e, (10)= 10101e, (tt) = 11011i s a gtoupc ode. (8)

Or

Find the minimum distance of the encoding function e: 82 -+ Ba

given by e(00) - 0000, e(10) = 0110, e(01) = 1011, e(11) = 1100. (8)

The intersection of any two subgroups of a gloup G is again a

subgroup of G. - Prove. (8)

Let the function f andg be defined /(r) =2x + 1 and

Determine the composition function f o g and g " f .

Let a and b be positive integers and suppose

recursively as follows :

. f0. if a<B)

th.b\=4

'

I

LQ(a-b,b)+l if b<A)

Find Q(2,5), Q(I2,5),8(58617,)

g(r)= x ' - 2 .

(8)

A is defined

(8)

(i)

(ii)

(b)

c

,

1 1 0

0 0 1

0 0 1

? ? ?

?

?

? ? ?

?

?

= G A

? ? ?

?

?

? ? ?

?

?

=

1 0 0

1 0 0

0 1 1

H A . (8)

14. (a) (i) If (G, ?) is an abelian group, show that ( )2 2 2 a ? b = a ? b . (8)

(ii) Show that (Z, +,×) is an integral domain where Z is the set of all

integers. (8)

Or

(b) (i) State and prove Lagrange's theorem. (8)

(ii) If (Z, +) and (E, +) where Z is the set all integers and E is the set

all even integers, show that the two semi groups (Z, +) and (E, +)

are isomorphic. (8)

15. (a) (i) Show that (N, ?) is a partially ordered set where N is set of all

positive integers and ? is defined by m ? n iff n ? m is a

non-negative integer. (8)

(ii) In a Boolean algebra, prove that (a ? b)? = a? ? b? . (8)

Or

(b) (i) In a Lattice (L, ?), prove that x ? (y ? z) ? (x ? y) ? (x ? z) . (8)

(ii) If 42 S is the set all divisors of 42 and D is the relation ‘‘divisor of’’

on 42 S , prove that { , } 42 S D is a complemented Lattice. (8)