NEW

2016

BCA

1st Semester Examination

DISCRETE MATHEMATICS WITH APPLICATION TO COMPUTER SCIENCE

PAPER—1103

Full Marks : 70

Time : 3 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

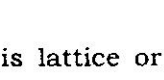
Answer *Q. No. 1* and any *six* from the remaining.

1. Answer any *five* questions : 5×2

(a) Let A = {1, 5, 6, 7, 9}, B = {5, 8, 7, 9, 10, 11} and C = {2, 3, 5, 7, 10}.

(b) State mathematical Induction :
Find A∪(B∪C), (A∪B) ∩ (A∪C)

(c) Define biconditional statement in mathematical logic.

(d) Wheather the poset is lattice or not. 

(e) Define symmetric difference of a Set.

(f) Find the recurrence relation of the sequence { 2, 3, 4, 5 ....., 2 + n, ...}

(g) Define Complete graph.

(h) Show that the set of even integers is not group under usual addition.

2. (a) Let A = Z (the set of integers) and let $n \in Z^+$ (the set of positive integers) and R= {(a, b) $\in$ A×A | a $\equiv$ b mod (n)} where a $\equiv$ b mod (n) means a and b yield the same remainder. Show that R is an equivalence relation. 4

(b) Prove that for any sets A and B A∪B = B∪A 4

(c) Define power set of a nonempty set. If a set has 3 elements then what is the number of elements of a power set ? 2

3. (a) Define bijective function. when a function is said to be invertible. Test the function f : R → R is invertiable or not $f(x) = x^2$. 2+1+2

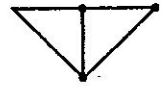
(b) Prove that the sum of degress of the vertices in an undivided graph is even. Test whether graph can be draw with 4 vertices with degree 2 and 3 vertices of degree 1. 3+2

4. (a) In how many arrangements of MATHEMATICAL be arranged whether vowels are adjacent. 5

(b) Solve the recurrence relation $a_n - a_{n-1} - 12a_{n-2} = 2 + 3n \quad a_0 = 0,\ a_1 = 1.$ 5

5. (a) Define Eulerian graph. A connected graph with 4 vertices with 4 degree and 2 vertices with 3 degree is not Eulerian graph. Justify your answer. 2+2

(b) Define spanning tree of a connected graph. Find one spanning tree of a graph. 2+1



(c) Define binary tree. Give an example of binary tree. 2+1

6. (a) Define Poset on a non-empty set. Show that the set Z^+ of all positive integers under divisibility relation forms a poset but the set Z of all integers is not poset under divisility. 2+2+2

(b) Define sub lattice of a lattice L. Show that the set $\{\varphi\ \{a\}, \{a,c\}, \{c\}, \{a,b,c\}\}$ is a sublattice of lattice $(P(s), \cup, \cap)$ where $S = \{a, b, c\}$. 2+2

7. (a) Show that $\sim p \rightarrow \sim p = p \rightarrow q$ 3

(b) Negate the statement :

(i) All integer are greater than 8.

(ii) For all real numbers x, is $x > 3$ than $x^2 > 9$. 3

(c) Prove the validity of the following argument :

"If I get the job and work hard, then I will get promoted. If I get promoted, then I will be happy. I will not happy. Therefore, either, I will not get the job or I will not work hard. 4

8. (a) Define group show that $A = \{1, \omega, \omega^2\}$ is abelian group with respect to multiplication. Deduce its proper subgroup. 2+4+1

(b) Define normal subgroup with example. 2+1

9. (a) Define Ring. In a Ring (R, +, .) prove that a.0 = 0.a = 0 2+3

(b) Simplify the Boolean expression using k–map $A\bar{B}\bar{C} + AB\bar{C} + ABC + A\bar{B}C + \bar{A}B\bar{C}$. 5

10. (a) Prove that $(A' + B)(A + B) = B$ by Boolean algebra. 3

(b) Express the Boolean expession $(yz + xz')(xy' + z)'$ in D.N.F. 4

(c) State De-Morgan's law in Boolean algebra. 3

———

12. Design a Buffer register and show the following result :

Input = 1010

Output = 1010

13. Design a ripple counter using J-K flip-flop. 30

14. Design a J-K master slave flip-flop and verify its result. 30

15. Design a 4 bit bidirectional shift register. 30

16. Design asynchronous up counter of the following MOD using IC-7476. 30

(i) MOD 10 (ii) MOD 5

17. Design a clocked SR and J-K flip-flop with preset and clear using NAND gates only. 30

18. Design a 4 bit bidirectional shift register. 30

19. Design AND and OR operation using DTL and establish its truth table. 30

20. Construct astable multivibrator using IC 555 timer. Measure its frequency and duty cycle by CRO.