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Paper Code : MCAN-104 Discrete Mathematics

UPID : 001610

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(i) How many pendant vertices/vertex does a binary tree have?

(ii) What is the negative of the statement 'No one wants to buy my house'

(iii) Write down the Fibonacci sequence.

(iv) If A = {1,2,3,4,5,6,7,8,9}, B={2,3,4,5}, C ={2,4,6,8}, D={ 4,5,6,7 }, find (B U C) U (A U D).

(v) If n pigeonholes are occupied by n+1 pigeons, then at least how many hole is occupied by more than one pigeon?

(vi) $(Z_6, +_6, x_6)$ is a ring of classes modulo 6. Write down the zero divisors of the ring.

(vii) The solution of the recurrence relation $S_n = 2S_{n-1}$ with $S_0 = 1$, find S_n.

(viii) Let S= { x, y ,z }, and R be a partially ordered relation such that x R y and y R z hold. Draw the Hasse diagram of this relation.

(ix) How many seven letter words can be formed using the letters of the word BENZENE?

(x) Give an example of an integral domain which is not a field.

(xi) If p: It is cold and q: It is raining then the statement. 'It is not raining and it is not cold' . Write down the symbolic form.

(xii) Let G be a cyclic group of prime order 11. Then how many generators does G have?

Group-B (Short Answer Type Question)

Answer any three of the following [5 x 3 = 15]

2. Consider the following [5]
p: This car is good
q: This car is cheap
Express the following symbolically:
i) This car is good and cheap
ii) This car is not good but cheap.
iii) This car is costly but good
iv) This car is neither good nor cheap
v) This car is good or cheap

3. Show that every cyclic group is an abelian group. [5]

4. Prove by mathematical induction [5]
1+2+3+4+.....=n(n+1)/2

5. If A ={ 1,2,3,4,5}, B ={1,2,4,7,8} and C={1,2,35,7,9}, Find (A UB)-C [5]

6. Prove that the sum of the degrees of all vertices in a graph is twice the number of edges in the graph. [5]

Group-C (Long Answer Type Question)

Answer any three of the following [15 x 3 = 45]

7. (a) Write down the negation of the statement [8]
i. If she studies, she will pass
ii. All Africans are bad
iii. There is no dog, that can talk.
iv. Someone has visited every part of India except Kolkata.

(b) Using truth table, verify the validity of the argument " If I drive to work, then I will arrive in time. I do not drive to work. Therefore I will not arrive in time." Not valid [7]

8. (a) IF A = {1,2} and B ={ 2,3}, C ={3,4}, then find [8]
i. (A X B) U (A X C)
II. (A X B) - (A X C)

(b) Show that the following relation on Z is symmetric, transitive but not reflexive: R={(a,b): a, b is integer and a.b>0} [7]

9. (a) On the set Z of integers, define a binary raleation R defined by a R b ={(a,b) such that a+b is even for all a,b in Z} [8]
Show that R is an equivalence relation.

(b) Show that the relation " is perpendicular to " on a set of all straight lines is symmetric but neither reflexive nor transitive. [7]

10. (a) Find the number of distinct permutations that can be formed from all the letters of the word [8]
i. RADAR
II. UNUSUAL

(b) How many different signals, each consisting of 8 flags hung in a vertical line, can be formed from a seat of 4 identical red flags, 3 identical white flags and a blue flag. [7]

11. (a) Show that the set of residue classes modulo 5 forms a group of order 5 w.r.t addittion of residue classes. [7]

(b) Write down the definition of an Integral Domain. [8]
Prove that every finite integral domain is a field.