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[5559]-201

S.E. (I.T.) (First Semester) EXAMINATION, 2019

DISCRETE STRUCTURES

(2015 PATTERN)

Time : 2 Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and Q. 7 or Q. 8.

(ii) Figures to the right indicate full marks.

(iii) Assume suitable data, if necessary.

Q1 A) A single card is drawn from an ordinary deck of 52 cards. Find the probability p that: 6
(i) the card is a face card
(ii) the card is face card and heart
(iii) the card is face card or heart.

B) In a survey of 60 people it was found that: 6
25 read Business India
26 read India Today
26 read Times of India
11 read both Business India and India Today
9 read both Business India and Times of India
8 read both India Today and Times of India
8 read none of these.

(i) How many read all three?
(ii) How many read exactly one?

OR

Q2 A) Use mathematical induction to show that: 6

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1} \quad \text{for all } n \geq 1$$

P.T.O.

- B) In a country club 60% of the players play tennis, 40% players play golf, 20% players play both tennis and golf. A member is chosen at random :
- (i) Find the probability that a member neither plays tennis nor golf.
 - (ii) If a member plays tennis, find the probability that member plays golf.
 - (iii) If a member plays golf, find the probability that member plays tennis.

- Q3 A) . Let $A = \{1, 2, 3, 4, 5\}$ and R be the relation on A such that $R = \{(1, 1), (1, 4), (2, 2), (3, 4), (3, 5), (4, 1), (5, 2), (5, 5)\}$. Find the transitive closure of R by Warshall's Algorithm 6
- B) Define the following with suitable example:
- (i) Cut set
 - (ii) Factors of graph
 - (iii) Weighted graph.

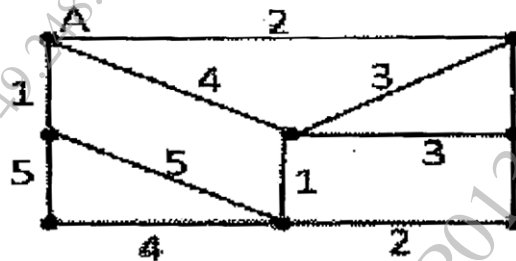
OR

- Q4 A) Find the solution to the recurrence relation 6
- $$a_n = 6 a_{n-1} - 11 a_{n-2} + 6 a_{n-3}$$
- with initial condition $a_0 = 2, a_1 = 5$ and $a_2 = 15$.

- B) Determine the number of edges in a graph with 6 nodes, 2 of degree 4 and 4 of degree 2. Draw two such graphs. 6

- Q5 A) Construct an optimal binary tree for the set of weights as $\{15, 22, 9, 11, 10, 13, 8\}$. Find the weight of an optimal tree. Also assign the prefix codes and write the code words. 6

- B) Find the minimum cost spanning tree of the following graph using Prim's algorithm. 7



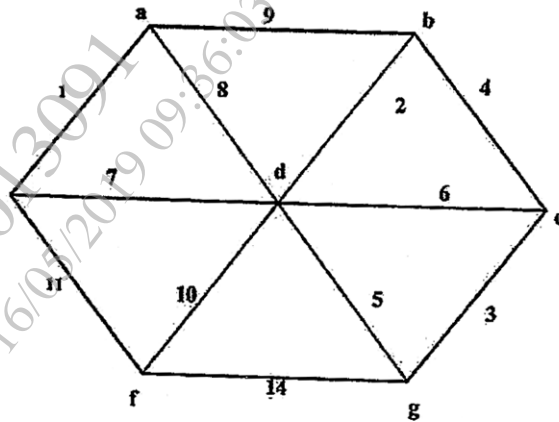
OR

- Q6 A) Suppose data items A,B,C,D,E,F,G occur in the following frequencies. Construct Huffman code for data and find minimum weighted path length 6

Items	A	B	C	D	E	F	G
Weight	10	30	5	15	20	15	5

B) Use Kruskal's algorithm to find minimum spanning tree of this graph.

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Q7 A) Consider the group $(\mathbb{Z}, +)$,
Prove that $(\mathbb{Z}, *)$ is an abelian group where $*$ is binary operation defined by $a*b = a+b+1$
for all $a, b \in \mathbb{Z}$

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B) Define the following with example :

6

- (i) Monoid
- (ii) Cyclic group
- (iii) Abelian group

OR

Q8 A) Let $Z_8 = \{0, 1, 2, 3, 4, 5, 6, 7\}$. Let R is a relation under the operations addition modulo 7 and multiplication modulo 7. Does this system form a ring? Is it a commutative ring?

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B) What is homomorphism and automorphism in an algebraic system? Explain by giving example of each.

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