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| Seat No. | |
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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
25 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

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

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.

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

- 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 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

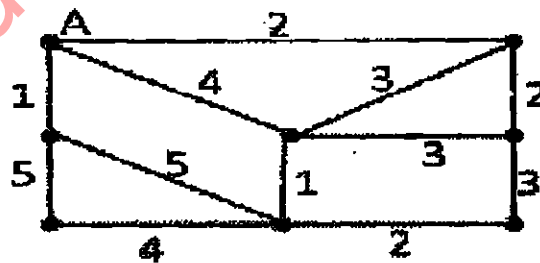
$$a_n = 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$$

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 6
 $\{15, 22, 9, 11, 10, 13, 8\}$. Find the weight of an optimal tree.
Also assign the prefix codes and write the code words.

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



OR

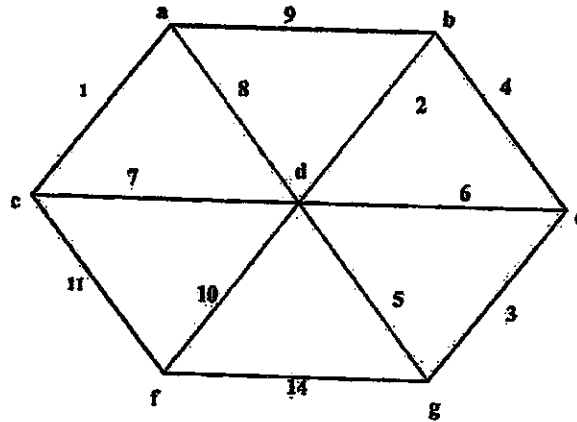
- Q6 A). Suppose data items A,B,C,D,E,F,G occur in the following frequencies. Construct Huffman code for data and find minimum weighted path length 6

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

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|--------|----|----|---|----|----|----|---|
| 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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