

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2019

B. Tech in Computer Science Engineering (CSE and IBM), Semester IV

Subject Code: CSE402

Roll No.....

Subject Name: Discrete Structures

Time: 3 hours

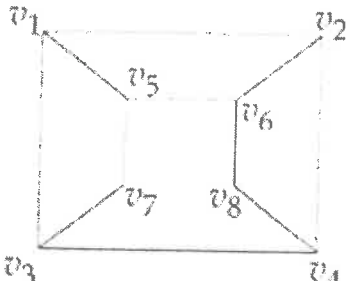
Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
4. Mapping of each question is done with learning outcome of the course in square bracket, which is circulated in the beginning of sem.

- Q.1 The police have three suspects for the murder of Mr. Cooper: Mr. Smith, Mr. Jones, and Mr. Williams. Smith, Jones, and Williams each declare that they did not kill Cooper. Smith also states that Cooper was a fiend of Jones and that Williams disliked him. Jones also states that he did not know Cooper and that he was out of town the day Cooper was killed. Williams also states that he saw both Smith and Jones with Cooper the day of the killing and that either Smith or Jones must have killed him. Can you determine who the murderer was if a) one of the three men is guilty, the two innocent men are telling the truth, but the statements of the guilty man may or may not be true? b) innocent men do not lie? 10 [LO 1-3]

- Q2 Four friends have been identified as suspects for an unauthorized access into a computer system. They have made statements to the investigating authorities. Alice said statements to the investigating authorities. Alice said "Carlos did it." John said "I did not do it." Carlos said "Diana did it." Diana said "Carlos lied when he said that I did it." a) If the authorities also know that exactly one of the four suspects is telling the truth, who did it? Explain your reasoning. b) If the authorities also know that exactly one is lying, who did it? Explain your reasoning. 10 [LO 1-3]

- Q3  10 [LO 10]

Identify whether the graph is bipartite or not.

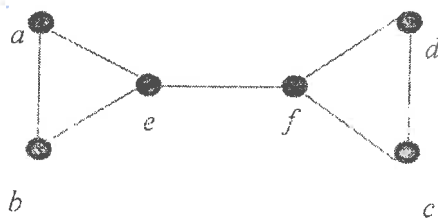
Apply kuratowski theorem on the graph.

- Q4 A discrete mathematics class contains I mathematics major who is a feshman, 12 mathematics majors who are sophomores, 15 computer science majors who 10 [LO 4, 5]

are sophomores, 2 mathematics majors who are juniors, 2 computer science majors who are juniors, and 1 computer science major who is a senior. Express each of these statements in terms of quantifiers and then determine its truth value.

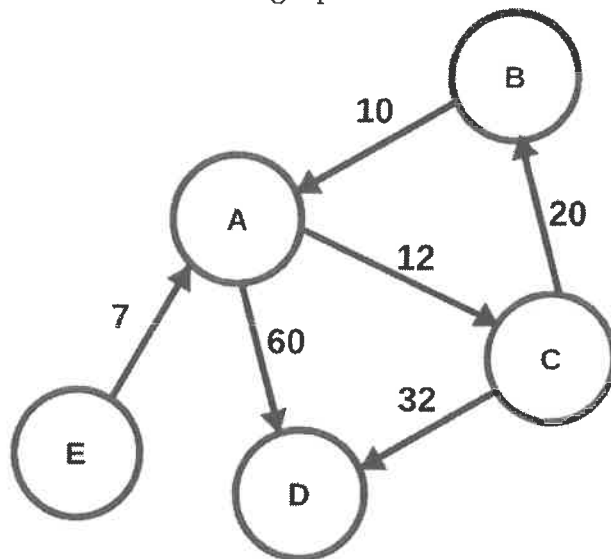
- There is a student in the class who is a junior.
- Every student in the class is a computer science major.
- There is a student in the class who is neither a mathematics major nor a junior.
- Every student in the class is either a sophomore or a computer science major.
- There is a major such that there is a student in the class in every year of study with that major.

- Q5 Prove the following:
The square of any integer is of the form $3k$ or $3k + 1$
Show that $2^{3n+1} + 5$ is always a multiple of 7
Prove that $\sqrt{2} + \sqrt{6} < \sqrt{15}$ 4+3+3
[LO 3]
- Q6 How many onto (or surjective) functions are there from an n -element ($n \geq 2$) set to a 2-element set? 10
[LO 5]
What is the possible number of reflexive relations on a set of 5 elements?
- Q7 Let S be a set of n elements. Find the number of ordered pairs in the largest and the smallest equivalence relations on S . 5
[LO 5]
- Q8 A partial order $\leq$ is defined on the set $S = \{x, a_1, a_2, \dots, a_n, y\}$ as $x < a_i$ for all i and $a_i \leq y$ for all i , where $n \geq 1$. Find the number of total orders on the set S which contain the partial order $\leq$. 5
[LO 6]
- Q9 Let F be the set of one-to-one functions from the set $\{1, 2, \dots, n\}$ to the set $\{1, 2, \dots, m\}$, where $m \geq n \geq 1$. a. How many functions are members of F ? b. How many functions f in F satisfy the property $f(i)=1$ for some i , $1 \leq i \leq n$? c. How many functions f in F satisfy the property $f(i) < f(j)$ for all $1 \leq i < j \leq n$? 5
[LO 5,7]
- Q10 Let $X = \{2, 3, 6, 12, 24\}$, Let $\leq$ be the partial order defined by $X \leq Y$ if x divides y . find the Number of edges in the Hasse diagram of $(X, \leq)$. 5
[LO 6]
- Q11 Prove that however one selects 55 integers $1 \leq x_1 < x_2 < x_3 < \dots < x_{55} \leq 100$, there will be some two that differ by 9, some two that differ by 10, a pair that differ by 12, and a pair that differ by 13. Surprisingly, there need not be a pair of numbers that differ by 11. 5
[LO 8, 9]
- Q12 Determine whether the given graph has a Hamilton circuit or Eulerian circuit. If it does, find such a circuit. If it does not, give an argument to show why no such circuit exists. 5
[LO 10]



Q 13 Traverse the graph shown below through BFS and DFS

5
[LO 10]



Q 14 What is the maximum number of different Boolean functions involving n Boolean variables?

5
[LO 5]