Course: B. Tech.   Branch : Computer Science & Engineering   Semester : III

Subject Code & Name: BTCOC302 _ Discrete Mathematics

Max Marks: 60   Date: 11/03/2023   Duration: 3 Hr.

Instructions to the Students:
1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly

		(BTLevel)	Marks
Q.1	Solve Any Two of the following.		12
A)	Among the integers 1 to 1000:	Apply	6

1) How many of them are not divisible by 3, or by 5, or by 7?

2) How many are not divisible by 5 and 7 but divisible by 3.

| B) | Prove that $1 + 2 + 2^2 + ... + 2^n = 2^{n+1} - 1$, where n is a nonnegative integer by using mathematical induction | Understand | 6 |
| C) | Let $S(x)$ be the predicate "x is a student," $F(x)$ the predicate "x is a faculty member," and $A(x, y)$ the predicate "x has asked y a question," where the domain consists of all people associated with your school. Use quantifiers to express each of these statements. | Understand | 6 |

    I. Lois has asked Professor Michaels a question.

    II. Every student has asked Professor Gross a question.

    III. Every faculty member has either asked Professor Miller a question or been asked a question by Professor Miller.

    IV. Some student has not asked any faculty member a question.

    V. There is a faculty member who has never been asked a question by a student

    VI. There is a faculty member who has asked every other faculty member a question

			12
Q.2	Solve Any Two of the following.		
A)	Let A={p,q,r}. Show (P(A), subset) is a poset and draw it's Hasse diagram.	Apply	6
B)	How many permutations of the letters a, b, c, d, e, f, g contain neither the pattern *bge* nor *eaf*?	Apply	6
C)	Determine whether each of these functions is one-to-one ,onto ,both or not a function. Justify your answer	Apply	6

1) from {a, b, c, d} to itself

    i. $f(a) = b, f(b) = a, f(c) = c, f(d) = d$

    ii. $f(a) = b, f(b) = b, f(c) = d, f(d) = c$
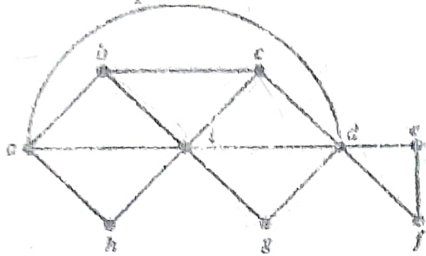
2) from Z to Z

    i. $f(n) = n + 1$

    ii. $f(n) = n3$

Q. 3 Solve Any two of the following.

A) Determine whether the given graph has an Euler circuit. Construct such a circuit when one exists. If no Euler circuit exists, determine whether the graph has an Euler path and construct such a path if one exists.
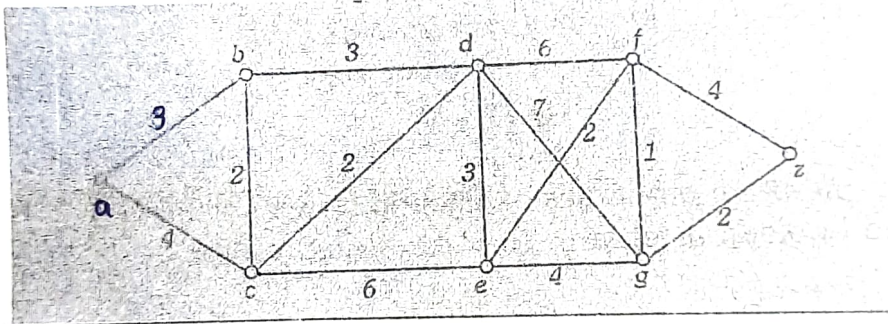
Apply

B) Find shortest path between a to z by Dijkstr'a Method.

Understand
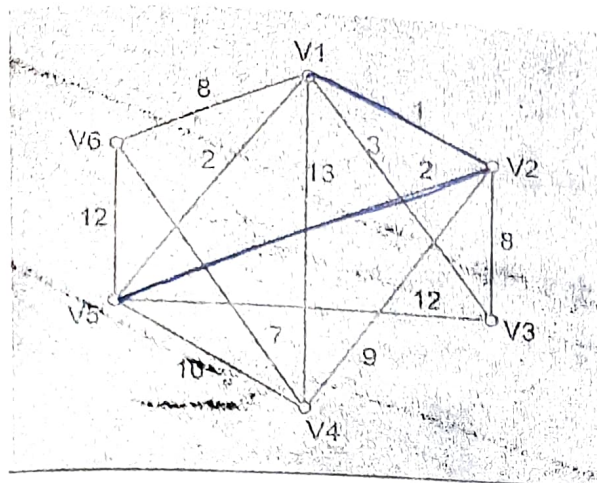

C) For the following maps
1) Draw the planar graph
2) Color the vertices of graph.
3) Find the chromatic number

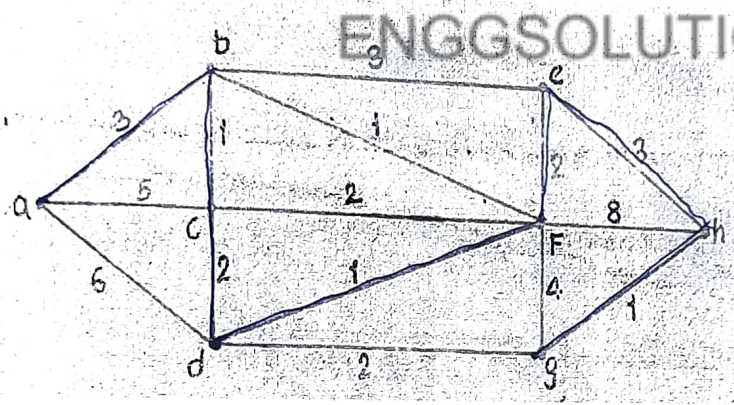*Apply*

Q.4 Solve Any Two of the following.

A) Find Minimum spanning tree for following graph by using Kruskal's algorithm.

Apply

B) Find Minimum spanning tree for following graph by Prim's Algorithm.　　　Apply　　6

ENGGSOLUTION

C) Define Rooted tree, Balanced Tree and Binary search tree. Explain with example　　Understand　　6

Q.5 Solve Any two of the following.　　12

A) Define Semigroup, Monoid and Group. Explain with example　　Remember　　6

B) Let $(G, \oplus)$ is an algebraic system where $G = \{1101, 0000, 1001, 0100\}$ prove that $(G, \oplus)$ is a group.　　Apply　　6

C) Define Ring . Prove that An algebraic system $(Z, +, .)$ is a ring, where $+$ is addition and . means multiplication operation. i.e. $a + b$ as the sum of a and b in Z, and $a . b$ as the product of a and b in Z.　　Apply　　6

*** End ***