

**B.TECH SEM - III (2007 COURSE) (COMPUTER ENGG.) : WINTER
- 2017**

SUBJECT: DISCRETE MATHEMATICS

Day: **Friday**
Date: **19/01/2018**

W-2017-2365

Time: **10.00 AM TO 01.00 PM**
Max. Marks: 80

N.B.:

- 1) **Q. No. 1 and Q. No. 5** are **COMPULSORY**. Out of the remaining attempt any **TWO** questions from each section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer book.
- 4) Use of non programmable **CALCULATOR** is allowed.

SECTION-I

- Q.1**
- a) State and prove De Morgan's law using Venn Diagram. **(05)**
 - b) $A = \{1, 2, 3, 4\}$, $B = \{1, 4, 6, 8, 9\}$; aRb if and only $b = a^2$. Find the domain, range of R. Find also its relation matrix and draw its diagraph. **(05)**
 - c) Prove that $\sqrt{2}$ is a irrational number. **(04)**
- Q.2**
- a) Obtain CNF and dnf of the following: **(06)**
 - i) $p \wedge (p \rightarrow q)$
 - ii) $\sim(p \vee q) \Leftrightarrow (p \wedge q)$
 - b) Among 130 students, 60 study Mathematics, 51 study Physics and 30 study both Mathematics and Physics. Out of 54 students studying Chemistry, 26 study Mathematics, 21 study Physics and 12 study both Mathematics and Physics. All the students studying neither mathematics nor Physics are studying Biology. Find:
 - i) How many are studying Biology?
 - ii) How many not studying Chemistry are studying Mathematics but not Physics?
 - iii) How many students are studying neither Mathematics nor physics nor Chemistry?**(07)**
- Q.3**
- a) Explain the terms: **(06)**
 - i) Equivalence relation
 - ii) Partial order relation
 - iii) Compatible relation
 - b) Let $f(x) = 2x + 3$, $g(x) = 3x + 4$, $h(x) = 4x$ for $x \in R$, where R = set of real numbers. Find gof, fog, hog, goh. **(07)**
- Q.4**
- a) Prove by induction that the sum of the cubes of three consecutive integers is divisible by 9. **(06)**
 - b) Prove by direct proof method "for all integers m and n if both m and n are even then m + n is even". **(07)**

P. T. O.

SECTION-II

Q.5 a) Determine the number of edges in a graph with 6 nodes, 2 of degree 4 and 4 of degree 2. Draw two such graphs. **(05)**

b) If there are 60 contestants in a single elimination tournament. How many matches are played? **(05)**

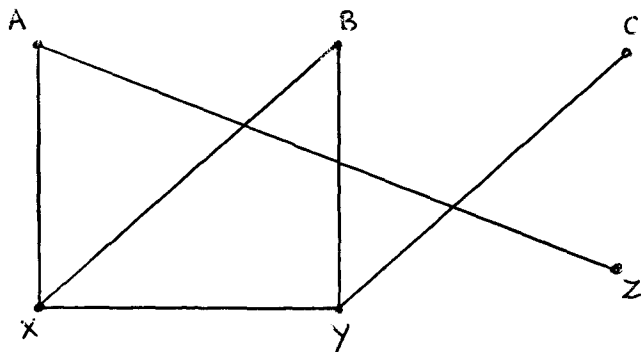
c) Prove that the ring $(Z_5, +, \cdot)$ is field. Is $(Z_6, +, \cdot)$ a field? **(04)**

Q.6 a) Define Graph and Draw the following graphs: **(06)**

- i) K_4 ii) R_5 iii) N_6 iv) $K_{5,3}$*

b) For a given graph G, find **(07)**

- i) All simple paths from A to C.
 ii) all cycle
 iii) Subhgraph H of G generated by $H = \{B, C, X, Y\}$



Q.7 a) Explain in detail Kruskal's algorithm. **(06)**

b) Construct an optimal tree for the weights 8, 9, 10, 11, 13, 15, 22. Find the weight of the optimal tree. **(07)**

Q.8 a) Show that $G = \{1, 5, 7, 11\}$ is a group under multiplication modulo 12. **(06)**

b) State and prove properties of Abelian group. **(07)**

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