

**B. TECH. SEM - III (COMPUTER ENGG.) 2014 COURSE) (CBCS)
: SUMMER - 2018**

SUBJECT: DISCRETE MATHEMATICS AND GRAPH THEORY

Day: Thursday
Date: 24/05/2018

S-2018-2238

Time: 02.30 PM TO 05.30 PM
Max. Marks: 60

N.B:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat diagrams **WHEREVER** necessary.

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- Q.1 a)** What is the concept of Multisets? Let $A = \{a, b\}$ and $B = \{a, c, d\}$ (05)
What is $A \times B$ and $B \times A$.
- b)** Eliminating Conditional and Biconditional, find logical equivalent forms of (05)
- i) $(p \leftrightarrow (q \vee r)) \rightarrow \bar{p}$
 - ii) $((p \rightarrow q) \rightarrow q) \rightarrow p$

OR

- Q.1 a)** Obtain the Disjunctive Normal Form of. (05)
- i) $(p \rightarrow q) \wedge (\sim p \rightarrow q)$
 - ii) $(p \wedge (p \rightarrow q)) \rightarrow q$
- b)** A survey among 1000 people, 595 are democrats, 595 wear glasses and 550 like ice-cream. 395 of them are democrats who wear glasses 350 of them are democrats who like ice-cream. 400 of them wear glasses and like ice-cream and 250 all the three. How many of them are not democrats, do not wear glasses and do not like ice-cream? (05)

- Q.2 a)** Define Relation? What are the different types of Relations? (05)
- b)** Draw the Hasse diagram of the following sets under the Partial Ordering Relation 'Divides' and indicate those which are Chains. (05)
- i) $\{2, 4, 12, 24\}$
 - ii) $\{1, 3, 5, 15, 30\}$

OR

- Q.2 a)** Define Recurrence Relation and solve the following Recurrence Relation. (05)
 $a_n - 8a_{n-1} + 16a_{n-2} = 0$ where $a_2 = 16$ and $a_3 = 8$
- b)** Let $A = \{a, b, c, d\}$ (05)
 $R_1 = \{(a,a), (b,b), (c,c), (a,b)\}$ and
 $R_2 = \{(a,a), (b,d), (d,c)\}$
Find $(R_1 \cup R_2)^*$ draw its diagram.

- Q.3 a)** Define One-One function and state whether the following functions are One-One. (04)
- i) To each person on the earth assign the number which corresponds to his age.
 - ii) To each country assign the number of people living in the country.
 - iii) To each book written by only one author, assign the author
 - iv) To each country having prime minister assign the prime minister.
- b)** Define Inverse functions? Also give the properties of inverse function? (06)
And prove that If $f: A \rightarrow B$ is bijective then the left and right inverses of f are equal.

OR

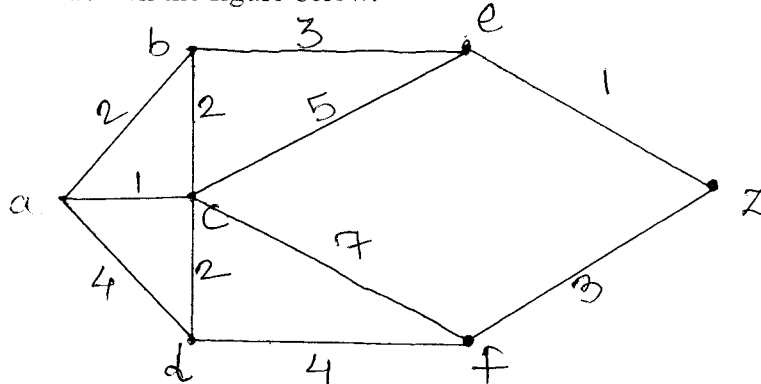
- Q.3 a)** Explain the concept of Hash Function and Logarithmic Functions with example. (05)
- b)** Let $f(x) = 2x+3$, $g(x) = 3x+4$, $h(x) = 4x$ for $x \in \mathbb{R}$ where \mathbb{R} = set of real numbers (05)
find $g \circ f$, $f \circ g$, $f \circ h$, $h \circ f$, $g \circ h$.

P.T.O.

- Q.4 a)** What do you mean by minimum spanning trees? Explain Prim's algorithm (05) with example.
- b)** Define the following terms with diagrams. (05)
- i) Hamiltonian Graph ii) Euler Circuit

OR

- Q.4 a)** Write a Pseudo Code for BFS Breadth- first Search algorithm, Also give the example showing how does BFS work? (05)
- b)** Apply Dijkstra's shortest path algorithm to find the shortest path between (05) vertices a and z in the figure below.



- Q.5 a)** What is Group? Show that the set of all idempotents in a commutative monoid (05) S is a submonoid of S .
- b)** Explain how does the error recovery is Obtained using group codes. (05)

OR

- Q.5 a)** Show that $\{1,2,3\}$ under multiplication modulo 4 is not a group but that (05) $\{1,2,3,4\}$ under multiplication modulo 5 is a group.
- b)** Define the terms: (05)
- i) Cyclic Group
ii) Monoid
iii) Ring

- Q.6 a)** A team of 11 players is to be chosen from a pool of 15. How many team (05) selections are possible? How many if one of the 15 has already been appointed captain and must play.
- b)** In how many ways can the 4 walls of a room be painted with 3 colours so that (05) no two adjacent walls have the same colour.

OR

- Q.6 a)** One of ten keys opens the door. If we try the keys one after another, what is (05) the probability that the door is opened on.
- i) The first attempt ii) The second attempt
- b)** What is pigeonhole principle? Also write down generalized pigeonhole (05) principle and give examples.