B. TECH. SEM - III (COMPUTER ENGG.) 2014 COURSE) (CBCS) :
WINTER - 2017
SUBJECT: DISCRETE MATHEMATICS AND GRAPH THEORY

Day: Friday
Date: 19/01/2018

Time: 10.00 AM TO 01.00 PM
Max. Marks: 60

W-2017-2030

N.B:

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

Q.1 **a)** Find the Conjunctive Normal Form and Disjunctive Normal Form for. **(05)**

i) $p \leftrightarrow (\overline{p} \vee \overline{q})$ ii) $(p \vee \overline{q}) \rightarrow q$

b) Explain the principle of inclusion-exclusion, If Set X has 10 members, how many members do $p(X)$ has? How many members of $p(X)$ are proper subsets of X? **(05)**

OR

Q.1 **a)** Write the following statements in symbolic forms. **(05)**

i) If I am not in good mood or I am not busy then I will go for movie.
Where,
P: I am in good mood
Q: I am busy
R: I will go for a movie

ii) If you know OOP and Oracle then you will get a job where,
P: You know OOP
Q: You know Oracle
R: You will get job

b) Among integers 1 to 300, how many of them are divisible neither by 3, nor by 5, nor by 7? How many of them are divisible by 3 but not by 5, nor by 7? **(05)**

Q.2 **a)** Consider the following five relations. **(05)**

i) Relation $\leq$ (less than or equal) on the set Z of integers.
ii) Set inclusion $\subseteq$ on a collection C of sets.
iii) Relation $\perp$ (perpandicular) on the set L of lines in the plane.
iv) Relation $\parallel$ (parallel) on the set L of lines in the plane.
v) Relation/of divisibility on the set N of positive integers.

Determine which of the above relations are reflexive.

b) Draw the Hasse diagram for the relation R on A = {1,2,3,4,5} whose relation matrix is given below. **(05)**

$$M_R = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

OR

Q.2 **a)** Solve the Recurrence Relations using Substitution Method. **(05)**
$a_n = a_{n-1} + 3$, $n \geq 2$ and $a_n = 2$ for $n = 1$

b) Define the following terms with examples. **(05)**

i) Equivalence relation
ii) Partial order relation

Q.3 **a)** Find the inverse of a function **(05)**

i) $f(x) = \frac{x+1}{x}$ ii) $f(x) = x^3 + 2$

b) What do you mean by Recursive Function? Also Explain the Recursion in Programming Languages and give it's types. **(05)**

P.T.O.

OR

Q.3 **a)** What do you mean by hash function? Give the details of Ackermann Function. **(05)**

b) Let $f_1(x) = x+4$, $f_2(x) = x-4$ and $f_3(x) = 4x$ for $x \in R$ where R is the set of real numbers find **(05)**

i) $f_2 \circ f_1$ ii) $f_1 \circ f_2$ iii) $f_1 \circ f_1$

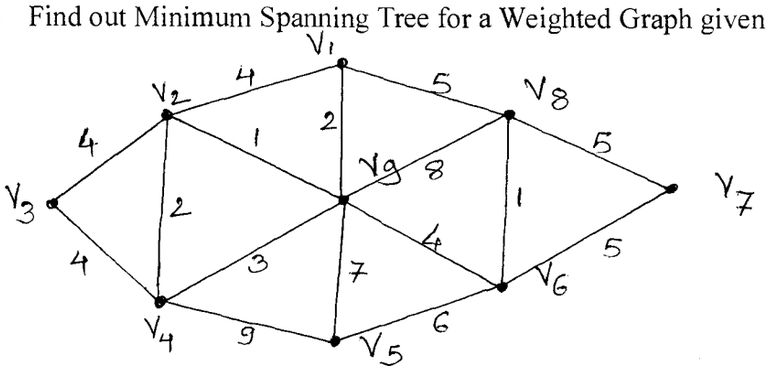
iv) $f_2 \circ f_2$ v) $f_3 \circ f_2$

Q.4 **a)** What are the different ways to represent Graphs in computer memory? Give the details of different Operations on Graph. **(05)**

b) Which are the different Graph Traversal Techniques? Give pseudo code for any one of them in detail. **(05)**

OR

Q.4 **a)** Find out Minimum Spanning Tree for a Weighted Graph given below **(05)**



b) Define the following terms with the help of diagrams. **(05)**

i) Binary Search Tree ii) Multigraphs and Subgraphs

Q.5 **a)** Define the homorphism? Consider the group $G = \{1,2,3,4,5,6\}$ under multiplication modulo 7. Find the multiplication table of G. **(05)**

b) Let G be a group and let A be a nonempty set. **(05)**

i) Define the meaning of the statement "G acts on A"

ii) Define the stabilizer H_a of an element $a \in A$

iii) Show that H_a is a subgroup of G

OR

Q.5 **a)** Consider the set N of positive integers and let * denote the operation of least common multiple (lcm) on N. **(05)**

i) Find 4 * 6, 3 * 5, 9 * 18, and 1 * 6

ii) Is (N, *) a semigroup? Is it commutative?

b) Prove Every Subgroup of a Cyclic Group G is Cyclic. (05)

Q.6 **a)** i) Find the number m of ways that nine toys can be divided between four children if the youngest child is to receive three toys and each of the other two toys. **(05)**

ii) Suppose a license plate contains two letters followed by three digits with the first digit not zero. How many different license plates can be printed?

b) Suppose a student is selected at random from 100 students where 30 are taking mathematics, 20 are taking chemistry and 10 taking mathematics and chemistry. Find the probability P that the student is taking mathematics or chemistry. **(05)**

OR

Q.6 **a)** i) How many committees of three can be formed from 8 people? **(04)**

ii) A farmer buys 3 cows, 2 pigs and 4 hens from a man who has 6 cows, 5 pigs and 8 hens. How many choices does the farmer have?

b) Determine the probability P of each event: **(06)**

i) An even number appears in the toss of a fair die.

ii) One or more heads appear in the toss of three fair coins.

iii) A red marble appears in random drawing of One marble from a box containing four white, three red and five blue marbles.