Exam.Code:0922
Sub. Code: 6837

1058

B.E. (Information Technology)
Fourth Semester
MATHS-402: Discrete Mathematics
(May – 2017)

Time allowed: 3 Hours Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.

x-x-x

Question I (a) What are the possible arrangements of the letters of the word MASSASAUGA. In how many of these arrangements are all the four A's together.

(b) Draw the Hasse diagram for the poset $(\mathbb{P}(U), \subseteq)$, where $U = \{1, 2, 3, 4\}$. Here $\mathbb{P}(U)$ denotes the power set of U.

(c) Give an example of a relation on a set containing at least three elements which is symmetric and reflexive but not antisymmetric or transitive.

(d) State the Absorption laws of logic and prove them using truth tables.

(e) What is an Eulerian path? What is the necessary and sufficient condition for a connected graph to have an Eulerian path?

$(2 \times 5 = 10)$

Part A

Question II (a) Write the following argument in symbolic form. Then establish the validity of the argument or give a counter example to show that it is invalid:

If Dominic goes to the racetrack, then Helen will be mad. If Ralph plays cards all night then Carmela will be mad. If either Helen or Carmela gets mad, then Veronica (their attorney) will be notified. Veronica has not heard from either of these two clients. Consequently, Dominic didn't make it to the racetrack and Ralph didn't play cards all night.

(b) Show the validity of the following argument using law of inferences:
$(p \vee q) \wedge \sim (\sim p \vee q) \iff p$

(5+5=10)

Question III (a) Let S be a set of six positive integers whose maximum is at most 14. Show that the sums of the elements in all the nonempty subsets of S cannot all be distinct.

(b) On the set of all integers, define the equivalence relation R by xRy for integers x and y if and only if 7 divides $x - y$. Explain what would be the equivalence classes of this equivalence relation.

(5+5=10)

Question IV (a) For $A = \mathbb{R}^2$, define a relation R on A by $(x_1, y_1)R(x_2, y_2)$ if $x_1 = x_2$. Verify that R is an equivalence relation on A. Also describe geometrically the equivalence classes and partition of A induced by R.

(b) In an examination a student is asked to answer any 7 out of 10 questions. In how many ways can this be done? Out of these ways how many ways are there in which the student answers 7 questions out of 10 selecting at least 3 from the first 5 questions.

(5+5=10)

P.T.O.

Part B

Question V (a) Determine the number of positive integers n, $1 \leq n \leq 100$ and n is not divisible by $2, 3$ or 5.

(b) How many permutations of $1, 2, 3, 4, 5, 6, 7$ are not derangements?

(5+5=10)

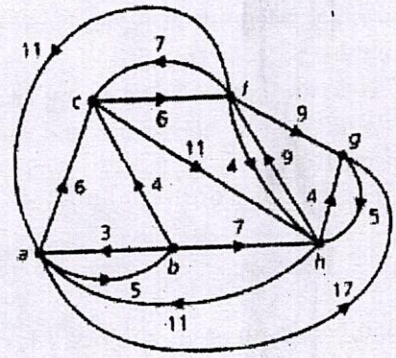
Question VI (a) Write the generating function for the number of partitions of a positive integer n into distinct summands.

(b) Solve the recurrence relation for Fibonacci sequence.

(5+5=10)

Question VII (a) Prove that the bipartite graph $K_{3,3}$ is not planar.

(b) Using Dijkstra's algorithm to the weighted graph below, find the shortest distance from the vertex c to each of the other five vertices in G.



(5+5=10)

x-x-x