CBCS Scheme

USN | | | | | | | | | |

16MCA15

First Semester MCA Degree Examination, June/July 2017

Discrete Mathematical Structures

Time: 3 hrs. Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Prove that for any three propositions P, Q and R without truth tables:
$(\sim P \wedge (\sim Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ **(03 Marks)**

b. Obtain the principle of conjunctive normal form of $(\sim P \rightarrow R) \wedge (Q \leftrightarrow P)$. **(03 Marks)**

c. If P and Q are propositions for which $P \rightarrow Q$ is false determine the truth values of:
i) $(P \wedge Q)$ ii) $\sim P \vee Q$ iii) $Q \rightarrow P$ iv) $\sim Q \rightarrow \sim P$ **(10 Marks)**

OR

2 a. Discuss different types of logical connectives with example and truth table. **(08 Marks)**

b. For establishing the validity of arguments, briefly explain different types of rules of inference. **(08 Marks)**

Module-2

3 a. Prove that for any 3 sets A, B and C, $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$. **(04 Marks)**

b. If A and B are any two sets, prove that $A - B = A - (A \cap B)$. **(04 Marks)**

c. Among 100 students, 32 literature, 20 study cycology, 45 study economics, 15 study literature and economics, 7 study literature and cycology, 10 study cycology and economics, 30 do not study any of three subjects, find:
i) The number of students studying all the 3 subjects.
ii) Number of students studying exactly one of three subjects. **(08 Marks)**

OR

4 a. What is function? Briefly explain different types of functions. **(04 Marks)**

b. Let A = {1, 2, 3, 4, 6} and R be a relation on A defined by aRb if and only if a is a multiple of b. Represent the relation R as a matrix and draw its digraph. **(06 Marks)**

c. Consider the partial order of divisibility on the set A. Draw the Hasse diagram of the poset A = {1, 2, 3, 5, 6, 10, 15, 30}. **(06 Marks)**

Module-3

5 a. If 10 points are selected from the interior of a triangle whose sides are of length 3 cms (each), show that atleast two points are within 1 cm apart. **(08 Marks)**

b. If you have 6 new year greeting cards and you went to send them to 4 of your friends, in how many ways can this be done? **(04 Marks)**

c. Find the number of subsets of the set {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11} having 4 elements. **(04 Marks)**

OR

6 a. For all $n \geq 0$ and $k \geq 0$, prove the following:
i) $c(n, 0) = 1$ ii) $c(n, n) = 1$
iii) $c(n, k) = c(n, n - k)$ iv) $c(n, k) = 0$ if $k > n$ **(06 Marks)**

b. Using binomial coefficient solve c(4, 2). **(04 Marks)**

c. The Ackerman's numbers A(m, n) are defined recursively for $m, n \in N$.

1. $A(0, n) = n + 1, n \geq 0$
2. $A(m, 0) = A(m - 1, 1)$ for $m > 0$
3. $A(m, n) = A(m - 1, A(m, n - 1))$ for $m, n > 0$.

Prove the following:

i) $A(1, n) = n + 2$ for all $n \in N$

ii) $A(2, n) = 3 + 2n, n \geq 0$. **(06 Marks)**

Module-4

7 a. State the Axioms of probability. **(03 Marks)**

b. If Charles tosses a coin four times, what is the probability that he gets two heads and two tails? **(06 Marks)**

c. Determine the number of positive integers n where $1 \leq n \leq 100$ and n is not divisible by 2, 3 or 5. **(07 Marks)**

OR

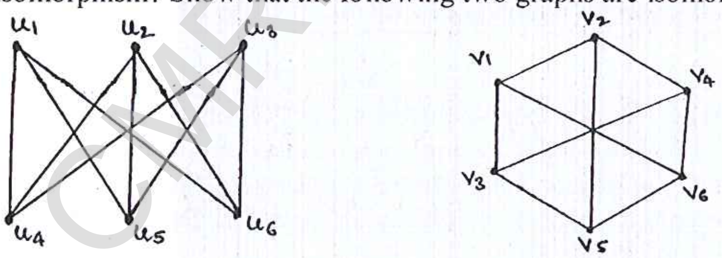
8 a. Define: i) probability, ii) conditional probability, with suitable example. **(08 Marks)**

b. There are n letters and n addressed envelopes. If the letters are placed in the envelopes at random, what is the probability that all the letters are not placed in the right envelopes? **(08 Marks)**

Module-5

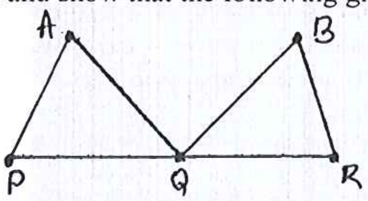
9 a. Define graph. Discuss different types of graph terminology and special types of graphs. **(08 Marks)**

b. What is isomorphism? Show that the following two graphs are isomorphic. **(08 Marks)**



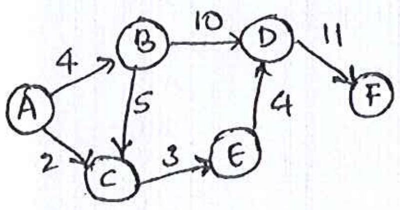
OR

10 a. Discuss Euler graphs and show that the following graph is Eulerian.



(08 Marks)

b. Define shortest path problem. Using Dijkstra's algorithm find the shortest path for the following graph.



(08 Marks)

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