Roll No .....

CS-3005-CBGS

B.E. III Semester

Examination, December 2020

Choice Based Grading System (CBGS)

Discrete Structures

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) 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?

   b) Prove by mathematical induction:
   $1 + 4 + 7 + ... + (3n - 2) = 2n\,(3n - 1)$

2. a) Prove :
   i) $A \times (B \cap C) = (A \times B) \cap (A \times C)$
   ii) $A \times (B \cup C) = (A \times B) \cup (A \times C)$

   b) Explain Pigeonhole principle with an example.

3. a) Show that the mapping $f : R \to R$, $f(x) = \frac{1}{x}$, $x \neq 0$ and $x \in R$ is one-one onto, where R is the set of non-zero real numbers.

   b) Prove that every finite group G is isomorphic to a per mutation group.

4. a) Show that

$[(p \wedge q) \Rightarrow p] \Rightarrow (q \wedge \sim q)$ is a contradiction.

b) Show that the language

$L = \{a^m : m = i^2, i \geq 1\}$ is not a finite state

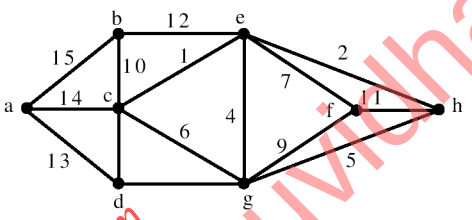
5. a) Prove by truth table that the following formula are tautologies

i) $(\sim q \Rightarrow \sim p) \wedge (q \Rightarrow p) \Rightarrow (p \Leftrightarrow q)$

ii) $(p \Leftrightarrow q \wedge r) \Rightarrow (\sim r \Rightarrow \sim p)$

b) Explain Pigeonhole principle with an example.

6. a) Find the shortest path of the following graph.



b) Define chromatic number with diagram.

7. a) Solve the recurrence relation

$a_{n+2} - 6a_{n+1} + 9a_n = 3(2^n) + 7(3^n), n \geq 0$

given test $a_0 = 1$ and $a_1 = 4$.

b) Explain Binomial theorem and prove it. Take any one example to illustrate the theorem.

8. Write short notes:

a) Properties of Lattice

b) Multinomial coefficients

c) Graph coloring

d) Universal and existential quantition

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