Subject Code: MC1313/R13

M C A - I Semester Regular/Supply Examinations, Dec/Jan – 2015-16
DISCRETE MATHEMATICAL STRUCTURES AND GRAPH THEORY
Time: 3 hours   Max Marks: 60

Answer any **FIVE** of the following
All questions carry equal marks.
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1. (a) Prove that $[(p \wedge \sim q) \rightarrow r] \rightarrow [p \rightarrow (q \vee r)]$ is a tautology.
   (b) symbolize the following argument and check for its validity:
   Lions are dangerous animals
   There are lions
   Therefore, there are dangerous animals.

2. (a) Let $X = \{1,2,3,4\}$ and $R = \{(x, y) \mid x > y\}$. Draw the graph of R and also give its matrix.
   (b) Let $X = \{1,2,3,4,5,6,7\}$ and $R = \{(x, y) \mid x-y$ is divisible by 3$\}$. Show that R is an
   equivalence relation. Draw the graph of R.

3. (a) Show that the functions $f(x) = x^3$ and $g(x) = x^{1/3}$ for $x \in R$ are inverse of one another.
   (b) Let $X = = \{1,2,3\}$ and f,g,h and s be functions from X to X given by f = { (1,2),(2,3),
   (3,1)}, g = { (1,2),(2,1), (3,3)}, h = { (1,1),(2,2), (3,1)} and s = { (1,1),(2,2), (3,3)}.
   Find fog, gof, fos, sog, fogos and gohos.

4. (a) Define group and sub group.
   (b) A non empty subset S of G is a sub group of $(G,*)$ iff for any pair of elements $a,b \in S$,

5. (a) How many committees of 5 or more can be chosen from 9 people?
   (b) How many integral solutions are there to $x_1 + x_2 + x_3 + x_4 + x_5 = 20$ where each $x_i \geq 2$?

6. (a) Solve the recurrence relation $a_n = a_{n-1} + f(n)$ for $n \geq 1$ by substitution method.
   (b) Solve the recurrence relation $a_n - 9a_{n-1} + 26 a_{n-2} - 24a_{n-3} = 0$ for $n \geq 3$ with initial
   conditions $a_0 = 0$, $a_1 = 1$ and $a_2 = 10$.

7. (a) Define lattice and show that $(P(\{1,2,3\}), \subseteq)$ is a lattice.
   (b) Prove that every chain is a distributive lattice.

8. (a) A complete graph K_n is planar iff $n \leq 4$.
   (b) Every simple planar graph is 5-colorable.
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