

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.

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 $R = \{(x, y) \mid x-y \text{ is divisible by } 3\}$. 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 $x \in \mathbb{R}$ 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 $f \circ g$, $g \circ f$, $f \circ s$, $s \circ f$, $f \circ g \circ s$ and $s \circ g \circ f$.
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 $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$ 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.
