RAJ KUMAR GOEL INSTITUTE OF TECHNOLOGY & MANAGEMENT, GZB

1st Sessional Examination 2017-18 (Odd Semester)

Roll No.:
Year/Branch: 2nd Year CSE/IT
Max Time: 1 Hours 30 Minute
Subject Name: Discrete St. & Theory of Logic
Subject Code: RCS - 301
Max Marks: 50

SECTION-A

Q.1 Attempt all parts. Write answer of each part in short.

(a) Prove that (A ∪ B)' = A' ∩ B'.

(b) Show that (p ∨ q) → r ≡ (p → r) ∧ (q → r).

(c) Check wheather relation R = { (a,b) | a>=b} on set of real numbers is an equivalence relation or not.

(d) Give the definition of recursively defined function

(e) Give an example of a relation which is symmetric and transitive but not reflexive.

SECTION-B

Note: Attempt any five questions from this section.

Q.2 Let R and S be the following relation on A = { a, b, c, d}, defined
R = { (a, a), (a, c), (c, b), (c, d), (d, b) } and S = { (b, a), (c, c), (c, d), (d, a) }
Find (a) RoS (b) SoR (c) RoR (d) SoS

Q.3 Analyse that ((p ∨ q) ∧ ¬ (¬ p ∧ (¬ q ∨ ¬ r))) ∨ (¬ p ∧ ¬ q) ∨ (¬ p ∧ ¬ r) is tautology.

Q.4 Prove by mathematical induction 6pow(n+2) + 7pow(2n+1) is divisible by 43 for each positive integer n.

Q.5 Let R = {(1, 2), (2, 3), (3,1)} and A = {1, 2, 3}, find the reflexive, symmetric and transitive closure of R, using
(i) Composition of relation R
(ii) Graphical representation of R

Q.6 Define Identity Law, Idempotent Law, absorption and involution law of logic.

Q.7 Write an equivalent formula for

$$p \wedge (q \leftrightarrow r) \vee (r \leftrightarrow p)$$

Which neither contains biconditional nor conditional connectives.

Q.8 Let A = {a,b,c} and R = {(a,a), (a,b), (a,c), (b,b), (c,c)} then evaluate reflexive clousure and symmetric clousure.

Q.9 Let A = {1, 2, 3, 4, 5, 6}, construct pictorial description of relation R on A for the following:

- R = {(J,K) : K is multiple of J}
- R = {(J,K) : $(J-K)^2$ Є A}
- R = {(J,K) : J divides K}
- R = {(J,K) : J x K is prime}

SECTION-C

Note: Attempt any two questions from this section.

Q.10 Let R be a relation on N, the set of natural numbers such that
R= {(x, y)| 2x+3y and x, y ∈ N} Find
(i) The domain and co-ordinate of R
(ii) R^{-1}

Q.11 Let f, g and h be functions from N to N where N is set of natural numbers so that
f(x) = x + 1, g(x) = 2x, h(x) = {0 if x is even, 1 if x is odd }. Determine
(i) fof (ii) gof (iii) fog
(iv) goh (v) hog (vi) (fog)oh (vii) go(fog)oh

Q.12 Use MI to show that $1 + 2 + 2^2 + \ldots + 2^n = 2^{n+1} - 1$ for all non-negative integers n.