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Reg. No. : ....

Name : ....

Third Semester B.Tech. Degree Examination, December 2015
(2008 Scheme)
08.303 : DISCRETE STRUCTURES (RF)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions.

1. Define well formed formula, converse and contra positive propositions.
2. Show that $P \to (Q \to R) \Leftrightarrow P \to (\neg Q \vee R) \Leftrightarrow (P \wedge Q) \to R$.
3. Give the truth table for the formula $((\neg P \to Q) \to (Q \to P))$.
4. Define compatibility relation. Give an example.
5. Use mathematical induction to show that $n^2 - 1$ is divisible by 8 whenever n is an odd positive integer.
6. Define a subgroup. Give an example.
7. Let a and b be elements of a group then prove that $(ab)^{-1} = b^{-1} a^{-1}$.
8. How will you represent a graph using adjacency matrix ?
9. Define an equivalence relation. Give an example.
10. Define a Ring. Give an example. **(10×4=40 Marks)**

PART – B

Answer **one full** question from **each** Module.

Module – 1

11. a) Show that the following premises are inconsistent. "If Raman is regular to school, then he fails in the school. If Raman Fails in the School, then he is uneducated. If Raman Studied by himself, then he is not uneducated. Raman is regular to the School and Studies by himself". 10

P.T.O.

b) Show that $(p \vee q) \wedge (q \rightarrow r) \wedge (q \rightarrow s) \Leftrightarrow s \vee r$. 10

OR

12. a) Show that $p \rightarrow (q \rightarrow r) \Leftrightarrow (p \rightarrow q) \rightarrow (p \rightarrow r)$. 10

b) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q, Q \rightarrow R, P \rightarrow M$ and $\neg M$. 10

Module – 2

13. a) Use mathematical induction to prove that every amount of postage of 12 cents or more can be formed using just 4 cent and 5 cent stamps. 10

b) Explain pointer and linked allocation of discrete structures. 10

OR

14. a) During a month with 30 days a baseball team plays at least one game a day, but no more than 45 games. Using Pigeon hole principle show that there must be a period of some number of consecutive days during which the team must play exactly 14 games. 10

b) Show that if f (x, y) defines the reminder upon division of y by x, then it is a primitive recursive function. 10

Module – 3

15. a) Show that if a group $(G, *)$ is of even order then there must be an element $a \in G$ where $a \neq e$ such that $a * a = e$. 10

b) Prove that every subgroup of a cyclic group is cyclic. 10

OR

16. a) Let $[L, \leq]$ be a lattice. Show that for any a, b $\in$ L the following holds : $b \leq c \Rightarrow a * b \leq a * c$ and $a \oplus b \leq a \oplus c$. 10

b) Define Boolean Algebra and Boolean function. Find the value of $x_1 * x_2 * [\,(x_1 * x_4) \oplus x_2' \oplus (x_3 * x_1')\,]$ for $x_1 = a$, $x_2 = 1$, $x_3 = b$, and $x_4 = 1$. 10
