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Reg. No. : ....

Name : ....

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

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. Define functionally complete set of connectives. Give example.
2. Symbolize the statement "All men are mortal".
3. Using n variables how many distinct formulas (formulas with distinct truth tables) are possible ? Justify your answer.
4. State rules of inference in statement calculus.
5. Give examples of two relations which are symmetric and antisymmetric.
6. Draw the Hasse diagram for $(P(A), \subseteq)$ where $A = \{a, b, c\}$ and P(A) its power set and $\subseteq$, the inclusion relation.
7. Determine the equivalence relation defined by $C = \{(a, b), \{c\}, \{d, e\}\}$ on $X = \{a, b, c, d, e\}$.
8. Define graph. Give an example.
9. Define Boolean algebra. Give an example.
10. Define ring. Give an example.

P.T.O.

PART – B

Answer **one** question from **each** Module. **All** questions carry **equal** marks.

Module – 1

11. a) Show that $R \to S$ can be derived from the premises $P \to (Q \to S)$, $\neg R \vee P$, and Q. **10**

    b) Show that $(x)\ (P(x) \to Q(x)) \wedge (x)\ (Q(x) \to R(x)) \Rightarrow (x)\ (P(x) \to R(x))$. **10**

OR

12. a) Prove that $(\exists x)\ (P(x) \wedge Q(x)) \Rightarrow (\exists x) P(x) \wedge (\exists x)\ Q(x)$. **10**

    b) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q$, $Q \to R$, $P \to M$ and $\neg M$ using rules of inference. **10**

Module – 2

13. a) Determine the quotient set of the relation congruence Modulo 3 on Z where Z is the set of positive integers. **8**

    b) Show that every equivalence relation on a set defines a partition on the set. **12**

OR

14. a) Show that infinite subset of a denumerable set is also denumerable. **10**

    b) Show that for $n \geq 2$, $n^4 - 4n^2$ is divisible by 3. **10**

Module – 3

15. Show that $(Z_7, +7, X_7)$ is a field. **20**

OR

16. a) Show that if $(G, *)$ is a finite cyclic group generated by an element $a \in G$ and G is of order n, then $a^n = e$. **10**

    b) Show that the ring of even integers is a subring of the ring of integers. **10**

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