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Question Paper Code : 75541

5 Year M.Sc. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fourth Semester

Software Engineering

XCS 241/10677 SW 401 — DISCRETE MATHEMATICS

(Common to 5 year M.Sc. Information Technology/ M.Sc. Computer Technology)

(Regulation 2003/2010)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Construct the truth table for $(P \vee Q) \vee \neg P$.

2. Define PDNF.

3. Define symmetric relation.

4. Check whether the function $f(x) = 5x^2 + 7$ is injective.

5. Prove that in a group the only idempotent element is identity element.

6. Define homomorphism.

7. Define a ring without unity.

8. Define field and give an example.

9. Define partially ordered set.

10. Define the term "Lattice". Give example.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Check the following proposition is tautogy $((P \to Q) \to R) \vee \urcorner P$. (8)

(ii) Show that $P \to (Q \to R) \Leftrightarrow \urcorner P \to (P \to Q)$. (8)

Or

(b) (i) Obtain PDNF of $P \vee (\urcorner P \wedge Q)$. (8)

(ii) Show the following argument is valid

Father praises Yaswanth only Yashwanth can be proud of himself. Either Yaswanth do well in sports or Yaswanth cannot be proud himself. If study hard, then Yaswanth cannot do well in sports. Therefore, if father praises Yaswanth, then Yaswanth do not study well. (8)

12. (a) (i) Let $f : \mathbb{R} \to \mathbb{R}$ and $g : \mathbb{R} \to \mathbb{R}$ where $\mathbb{R}$ is the set of real numbers. Find $f \circ g$ and $g \circ f$, if $f(x) = x^2 - 2$ and $g(x) = x + 4$. (8)

(ii) Suppose that the relation $\mathbb{R}$ on a set is represented by the matrix $M_R = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{pmatrix}$. Is R is reflexive, symmetric and /or antisymmetric. (8)

Or

(b) Show that $f : \mathbb{R} \to \{3\} \to \mathbb{R} \to \{1\}$ given by $f(x) = \dfrac{x-2}{x-3}$ is a bijective and find its inverse. Also compute $f \circ f^{-1}$. (16)

13. (a) (i) Prove that the set Z of all integers with binary operations $*$ defined by $a * b = a + b - 1 \ \forall \ a, b \in G$ is an abelian group. (8)

(ii) Let $\phi : G \to \overline{G}$ defined by $\phi(a) = \overline{e}$. Prove that $\forall a \in G$ is homomorphism. (8)

Or

(b) (i) If $(H_1, *)$ and $(H_2, *)$ are both subgroups of the group $(G, *)$, then $(H_1 \cap H_2, *)$ is also a subgroup. (8)

(ii) Prove that there exists a one-to-one correspondence between the elements of subgroup H and those of any costs of H in G. (8)

14. (a) Show that the system $(E, +, \cdot)$ of even integers is a ring when ordinary addition and multiplication. (16)

Or

(b) Show that finite integral domain is a field. (16)

15. (a) (i) Prove that every distributive Lattice is modular, but not conversely. (8)

(ii) Let $a, b, c \in B$. Show that

(1) $a. 0 = 0$

(2) $a + 1 = 1$. (8)

Or

(b) State and prove Demorgan's law of lattice. (16)