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Question Paper Code : 31143

15.5.13

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Fifth Semester

Computer Science and Engineering

080230017 — DISCRETE MATHEMATICS

(Regulation 2008)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define tautology.

2. Determine whether the conclusion follows logically from the premises or not $H_1 : P \to Q$ $C : P \to (P \wedge Q)$.

3. Define Universal quantifier.

4. Write the symbolic form of the expression : Some men are giant.

5. Let $A = \{a, b, c\}$ and $B = \{1, 2, 3\}$. Then find $A \times B$.

6. Define a relation on a set and give an example.

7. If $f : A \to B$, where $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c, d\}$ is defined by $f = \{(1, a), (2, a), (3, c), (4, d)\}$, show that f is a function, but f^{-1} is not.

8. Define recursive function.

9. Define an algebraic system.

10. Define normal subgroup.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Show that the following premises are inconsistence.

(1) If jack misses many classes through illness, then he fails high school

(2) If Jack fails high school, then he is uneducated

(3) If Jack reads a lot of books, then he is uneducated

(4) Jack misses many classes through illness and reads a lot of books. (8)

(ii) Obtain the principle disjunctive normal form of $S: p \wedge \urcorner(q \wedge r) \vee (p \rightarrow q)$. Hence find pcnf. (8)

Or

(b) (i) P.T $P \rightarrow S$ is a valued conclusion of the premise. $\urcorner P \vee Q, \urcorner Q \vee R, R \rightarrow S$. (8)

(ii) Determine whether the following compound proposition is a tautology or not $((p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)) \rightarrow r$. (8)

12. (a) (i) Prove that $(\exists x)[P(x) \wedge Q(x)] \Rightarrow (\exists x) P(x) \wedge (\exists x) Q(x)$. Is the converse is true? (8)

(ii) Show that $\urcorner P(a,b)$ follows logically from $(x)(y)[P(x,y) \rightarrow W(x,y)]$ and $\urcorner W(a,b)$. (8)

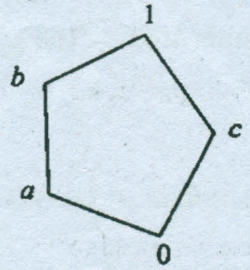
Or

(b) (i) Show by direct method of proof, that $\forall x (p(x) \vee q(x)) \Rightarrow (\forall x\, p(x)) \vee (\exists x q(x))$. (8)

(ii) Show that the premises "one student in this class known how to write programs in JAVA" and "Every one who knows how to write programs in JAVA can get a high-paying job" imply the conclusion "Someone in this class can get a high-paying job". (8)

13. (a) (i) In a complemented and distributive lattice, prove that complement of each element is unique. (8)

(ii) Prove that the lattice whose hasse diagram given below is not modular. (8)



Or

(b) (i) Let $A = \{1, 2, 3, 4, 5, 6, 7\}$. Define R and A by $x \, \mathrm{R} y$ if and only if $x - y$ is divisible by 3. Prove that R is an equivalence relation. (8)

(ii) State and prove De Morgan's laws in Boolean algebra. (8)

14. (a) (i) Let f, g be function $f : N \to N$ defined by $f(n) = n + 1$, $g(n) = 2n$. Find $f \circ f$, $f \circ g$, $g \circ f$, $f \circ g$. (8)

(ii) Let $A = \{1, 2, 3\}$

(1) List all the permutation from A to A

(2) Find square all the permutation

(3) Find inverse all the permutation

(4) Prove that product of permutation is again a permutation. (8)

Or

(b) (i) Let $A = \{1, 2, 3\}$ and f, g, h and s be function from A to A given by

$f = \{(1, 2)(2, 3)(3, 1)\}$; $g = \{(1, 2)(2, 1)(3, 3)\}$

$h = \{(1, 1)(2, 2)(3, 1)\}$; $s = \{(1, 1)(2, 2)(3, 3)\}$

Find $f \circ g, g \circ f, f \circ h \circ g, g \circ s, s \circ s, f \circ s$. (8)

(ii) Using characteristics functions, prove that

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$. (8)

15. (a) State and prove Lagrange's theorem. (16)

Or

(b) Find the code words generated by the parity check matrix $H = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ when the encoding function is $e: B^3 \to B^6$. (16)
