Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 60318

M.E. DEGREE EXAMINATION, MAY/JUNE 2017.

Second Semester

Computer Science and Engineering

CP 7201 — THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE

(Common to M.E. Computer Science and Engineering (With Specialization in Networks))

(Regulations 2013)

Time : Three hours Maximum : 100 marks

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Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Identify the primitive function $f(x, y) = x^y$.

2. Give an example for structural induction.

3. Define the semantics of predicate logic.

4. Compare SLD with SLDNF Resolution.

5. Define parametric polymorphism.

6. State Church-Rosser theorem.

7. Identify the chromatic number of K_m and C_n?

8. Compute Hamiltonian cycle in the graph formed by the vertices and edges of an ordinary cube.

9. Identify the grammar that generate the language $L = \{0^n 10^n / n \geq 0\}$

10. List out the types of Phrase-structure grammars.

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PART B — (5 × 13 = 65 marks)

11. (a) (i) Draw the Hasse diagram for the Poset $(A, \subseteq)$ where A denote the power set of set $\{a, b, c\}$. (7)

(ii) State recurrence relation for Fibonacci sequence and hence solve it. (6)

Or

(b) After explaining the basics of pigeonhole principle, prove it. There are 50 baskets of apple. Each basket contains no more than 24 apples. Show that using the pigeonhole principle, there are at least 3 baskets containing the same number of apples. (13)

12. (a) (i) Compute $(\text{CNF}(\text{NNF}(\text{IMPL-FREE}((\neg p \wedge q \rightarrow p \wedge (r \rightarrow q)))))$. (6)

(ii) Describe in detail about Davis putnam procedure. (7)

Or

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(b) (i) Express the following premises are inconsistent : (7)

(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 not uneducated.

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

(ii) Explain Inferences in the first order logic in details. (6)

13. (a) (i) Write a brief note on Free and Bound variables. (7)

(ii) Remove any name clashes in the expressions $\lambda a.\ (\lambda b.\ a\lambda.b.(\lambda a.ab))$. (6)

Or

(b) (i) Give examples and explain in detail about beta reduction. (6)

(ii) Discuss in detail about Chureb-Rosser theorems. (7)

14. (a) (i) Evaluate a simple graph with n vertices and k components can have at most $\{(n-k)(n-k+1)\}/2$ edges. (8)

(ii) Illustrate digraph with an example. (5)

Or

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(b) (i) Define a complete graph K_n Draw a complete graph K_7. What is the edges of each Vertex in K_n? What is the total number of edges in K_n? (7)

(ii) Analyze: G be an undirected graph, then G is bipartite if and only if it contain no odd cycle. (6)

15. (a) (i) Define non-deterministic finite automata with an example and also define the language accepted by NFA. (8)

(ii) Write short notes on Decidability. (5)

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Or

(b) Design a Turing machine which accepts all strings of the form $a^n b^n$ for $n >= 1$ and rejects all other strings. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Formulate and Translate these "let" expressions into lambda expressions and reduce them. Also write the expressions using" where" instead of "let". (15)

(i) Let $x = 5$ in let y = (add x 3) in (mul x y)

(ii) Let $a = 7$ in let $g = x\lambda$. (mul a x) in let $a = 2$ in (g 10).

Or

(b) Define functions to test whether or not a number is 'less than', or 'less than or equal to' another number def less xy = ...: def less_or_equal xy =... (15)

Evaluate

(i) Less three two

(ii) Less two three

(iii) Less two two

(iv) Less_or_equal three two

(v) Less_or_equal two three.

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