OCTOBER 2013 **P/ID 17401/RBA**

Time : Three hours Maximum : 75 marks

PART A — (5 × 5 = 25 marks)

Answer ALL questions.

All questions carry equal marks.

1. (a) What is Well-formed. Give any two examples.

Or

(b) Show that $\neg p(a,b)$ follows logically from $(x)(y)(p(x,y \to w(x,y)))$ and $\neg w(a,b)$.

2. (a) If $A=\{\alpha,\beta\}$ and $B=\{1,2,3\}$. What are $A\times B$, $B\times A$, $A\times A$, $B\times B$ and $(A\times B)\cap(B\times A)$?

Or

(b) Define partial order relation. Give an example.

3. (a) Define

(i) Mono morphism

(ii) Epimorphism.

(iii) Isomorphism

(iv) Automorphism.

Give an example for each.

Or

(b) Define

(i) Cyclic

(ii) Dihedral group.

Give an example for each.

4. (a) Write short notes on

(i) Simple path

(ii) Elementary path

(iii) Cycle with respect to graph with examples.

Or

(b) Write an algorithm for post order tree traversal.

5. (a) Consider the grammar which has the following productions.

$S \to \alpha SBC / \alpha BC$

$CB \to BC; bC \to bc; bB \to bb$

$\alpha B \to ab; cC \to cc$.

Draw the derivation tree for the strings abc and $a^2b^2c^2$.

Or

(b) Write short notes on notions of fault detection.

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

All questions carry equal marks.

6. (a) Show that $((p \to q) \to (q \to r)) \to (p \to r)$ is a tautology. (5)

(b) Obtain the conjunctive normal form for $(p \wedge \neg(q \vee r)) \vee (((p \vee q) \vee r) \wedge p)$. (5)

7. (a) Show that $r \wedge (p \vee q)$ is a valid conclusion from the premises $p \vee q, q \to r, p \to m$ and $\neg m$. (6)

(b) Symbolise the expressions using predicate calculus

(i) all the world loves a lover (2)

(ii) all men are giants. (2)

8. (a) Show that for any two sets A and B $A - (A \cap B) = A - B$. (5)

(b) Prove that the relation "congruence modulo m" given by $\equiv = \{ < x, y > | \, x - y$ is divisible by m $\}$ over the set of positive integers is an equivalence relation. (5)

9. (a) Let $X = \{1,2,3\}$ and f, g, h and s be functions from X to x 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 (i) $f \circ g$, (ii) $f \circ s$, (iii) $f \circ h \circ g$. (5)

(b) Show that $f < x, y >= x^y$ is a primitive recursive function. (5)

10. (a) State and prove lagrange's theorem. (5)

(b) Construct a grammar which generates the language $L(G) = \{a^n\, b^n\, c^n \mid n \geq 1\}$. (5)

11. (a) Convert the infix expression $(a + b \uparrow c \uparrow d) * (e + f / d)$ into polish form. (3)

(b) For any commutative monoid $< M, * >$ the set of idempotent elements of M forms submonoid. (7)

12. (a) Explain any three matrix representation of graphs with examples. (5)

(b) Write a detailed note on parsing algorithm for simple precedence grammars. (5)

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