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Code No. : 1713 Sub. Code : R 4 CS 21/ B 4 CS 21

B.Sc. DEGREE EXAMINATION, APRIL 2011.

Second Semester

Computer Science — Allied

Paper II — MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE

(For those who joined in July 2008 and afterwards)

Time : Three hours Maximum : 100 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. $(A \subseteq B)$ and $(B \subseteq C) \Rightarrow (A \subseteq C)$ is

   (a) Reflexive (b) Symmetric

   (c) transitive (d) none

2. If a relation is symmetric, then the corresponding relational matrix is

   (a) symmetric (b) not symmetric

   (c) relation (d) none

3. $(gof)^{-1} =$ ——————

   (a) $f^{-1}og^{-1}$ (b) $g^{-1}of^{-1}$

   (c) fog (d) none

4. If $f(x)=x+2, g(x)=x-2$ and $h(x)=3x$ for $x \in R$, where R is the set of all real numbers. Then $(foh)og$ is

   (a) $\{<x,3x-4>/x \in R\}$ (b) $\{<x,3x+6>/x \in R\}$

   (c) $\{<x,x>/x \in R\}$ (d) none

5. If there are n statement variables then there are —————— minterms

   (a) 2^x (b) $2x$

   (c) n (d) none

6. A set of statements which lead to a valid conclusion is called ——————.

   (a) argument (b) inference

   (c) contradiction (d) none

7. If a graph has neither loops nor parallel edges is called ——————

   (a) simple graph (b) Multigraph

   (c) Directed graph (d) none

8. An undirected graph has an even number of vertices of ———————— degree.

(a) odd (b) even

(c) zero (d) none

9. The out degree of a vertex v denoted by

(a) deg (v) (b) deg (v)

(c) $\deg(v)$ (d) none

10. Any strongly connected directed graph is also ———————— connected.

(a) Multi (b) Simply

(c) Weakly (d) none

PART B — (5 × 6 = 30 marks)

Answer ALL questions choosing either (a) or (b).

11. (a) Explain the properties on Binary relation.

Or

(b) Show whether the following relations are transitive:

$R_1 = \{<1,1>\}, R_2 = \{<1,2>,<2,2>\}$ and

$R_3 = \{<1,2>,<2,3>,<1,3>,<2,1>\}$.

12. (a) Define

(i) function

(ii) Bi-jective

(iii) surjective functions

Or

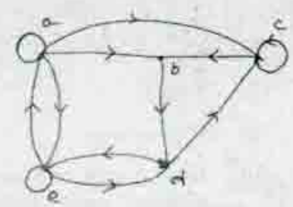
(b) Let $f: R \to R$ and $g: R \to R$, where R is the set of real numbers. Find fog and gof, where $f(x) = x^2 - 2$ and $g(x) = x + 4$. State whether these functions are infective, subjective and bijective.

13. (a) Explain negation and conjunction with truth table.

Or

(b) Obtain pdnf for $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$.

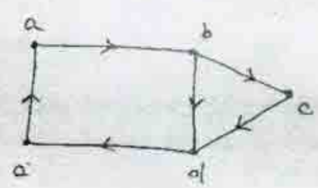
14. (a) Find the in degree and out degree of each vertex in the graph G with directed edges in the following figures:



Or

(b) Explain the types of graphs with example.

15. (a) Show that the following graph is strongly connected:



Or

(b) Explain connected and disconnected graph with examples.

PART C — (5 × 12 = 60 marks)

Answer ALL questions choosing either (a) or (b).

16. (a) Show that

(i) $(A-B)\cup(B-A)=(A\cup B)-(A\cap B)$

(ii) $A-(B\cup C)=(A-B)\cap(A-C)$

Or

(b) Explain the properties of Binary relation.

17. (a) Prove that the inverse of a composite function is equal to the composition of the inverses in the reverse order.

Or

(b) Define

(i) inverse function

(ii) identity mapping and also prove that if $f:x\to y$ is invertible then $f^{-1}of=I_x$ and $fof^{-1}=I_y$.

18. (a) Show that

(i) $P\Leftrightarrow(P\wedge Q)\vee P$

(ii) $P\vee(\neg P\wedge Q)\Leftrightarrow P\vee Q$

Or

(b) Obtain the pdnf for

(i) $(P\wedge Q)\vee(\neg P\wedge R)\vee(Q\wedge R)$

(ii) $\neg P\vee Q$.

19. Explain

(a) Graph

(b) simple graph

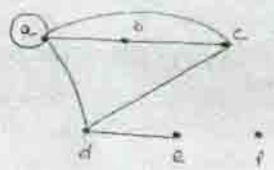
(c) multigraph and pseudo graph and also draw a diagram for each of the following graph $G(V,E)$.

(i) $v=\{a,b,c,d,e\}, E=\{(a,a),(b,c),(b,d),(c,b),$
$(e,a),(e,d)\}$

(ii) $v=\{a,b,c,d,e\}, E=\{(a,d),(b,c),(b,d),(b,e),$
$(d,e),(c,e)\}$

Or

(b) Prove that the number of vertices of odd degree in a graph is always even. And also prove this by following graph.



20. (a) Prove that a tree $T(v,E)$ with n vertices has $(n-1)$ edges.

Or

(b) Define

(i) Tree

(ii) Binary tree

(iii) Rooted tree and also prove that there is unique path between each pair of vertices in a tree $T(v,E)$.