Discrete Structures
Final Exam: 10-6-2004
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EACH PROBLEM IS WORTH 2.5 POINTS

1. Which proposition is a contradiction?
   (a) $(A \rightarrow \text{False}) \wedge (\neg A \rightarrow \text{False})$ (b) $(A \wedge B) \rightarrow B$
   (c) $(A \rightarrow B) \wedge A$ (d) $(\neg A \rightarrow \neg B) \wedge A$

2. Which proposition is <u>not</u> equivalent to $(\neg A \wedge B) \rightarrow C$?
   (a) $A \vee (B \rightarrow C)$ (b) $C \vee (B \rightarrow A)$
   (c) $(A \rightarrow C) \vee B$ (d) $C \vee B \vee A$

3. The decimal number 0.28125 in binary is
   (a) 0.0010101   (b) 0.01001
   (c) 0.01010   (d) 0.00110

4. The binary number 101110 in hexadecimal is
   (a) B8   (b) 2E
   (c) 8E   (d) B2

5. Which numbers satisfy a mod 3 = b mod 3 ?
   (a) 2 and 9   (b) 33 and 66
   (c) 0 and 100   (d) 17 and 18

6. The value of GCD (144, -278) is equal to
   (a) 12   (b) 84
   (c) 2   (d) -21

7. The sequence 1, 2, 4, 8, 16, 32, … satisfy the recurrence relation
   (a) $S_n = 2 n$ (b) $S_n = S_{n-1}^{2}$
   (c) $S_n = 2 S_{n-1}$ (d) $S_n = S_{n-1} + S_{n-2}$

8. How many positive integers ≤ 100 are multiples (divisible) of 2 or 3?
   (a) 67   (b) 83
   (c) 16   (d) 50

9. If R = {(1,x), (2,x), (3,y)} and S = {(x,R), (y,P), (y,Q)} then S ° R is equal to
   (a) {(1,x), (2,R), (3,P), (3,Q)}   (b) {(1,R), (2,R), (3,P), (3,Q)}
   (c) {(1,Y), (2,Y), (3,Q), (2,R)}   (d) {(1,x), (2,x), (3,R), (2,P)}

10. Which relation R is <u>not</u> transitive?
    (a) {(1,1), (2,2)}   (b) {(1,2), (2,3), (1,3)}
    (c) {(1,2), (2,1), (1,1)}   (d) { }

11. Which matrix represents an equivalence relation?

(a) $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$
(b) $\begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{pmatrix}$
(c) $\begin{pmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{pmatrix}$
(d) $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$

12. Which one is the Hasse diagram for the following digraph?

(a)   (b)   (c)   (d)
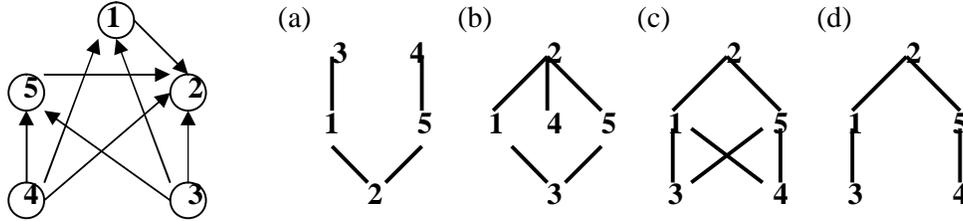
13. The degree of K_n is equal to
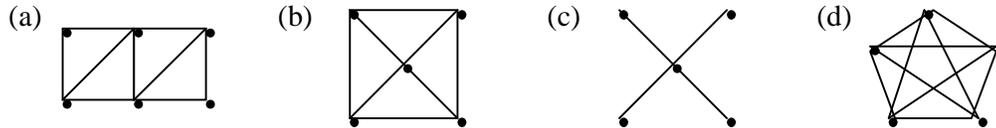(a) n^2
(b) $n^2 + n$
(c) $n^2 - n$
(d) $2n - 1$

14. What is the number of nodes (points) in a complete graph K_n with 36 edges?
(a) 8
(b) 44
(c) 9
(d) 10

15. Which sequence is a possible degree sequence?
(a) 0,0,1,2,1,1,1,0,0,…
(b) 0,0,5,0,3,0,4,0,0,…
(c) 0,0,1,3,2,0,2,0,0,…
(d) 0,1,2,1,3,1,4,0,0,…

16. Which graph has an Euler circuit?
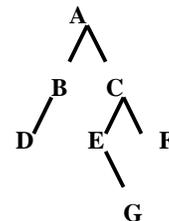
(a)   (b)   (c)   (d)

17. Which graph is planar?
(a) K_5
(b) K_6
(c) $K_{2,3}$
(d) $K_{3,3}$

18. Which graph is a tree?
(a) K_3
(b) K_4
(c) $K_{1,3}$
(d) $K_{2,2}$

19. The result of post-order algorithm for this labeled binary tree is
(a) G, E, F, C, D, B, A
(b) C, F, E, G, D, B, A
(c) D, B, A, G, E, C, F
(d) D, B, G, E, F, C, A

20. The result of in-order algorithm (for the same tree) is
(a) G, E, F, C, D, B, A
(b) D, B, A, E, G, C, F
(c) D, B, A, G, E, C, F
(d) D, B, G, E, F, C, A