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CS-35

All questions worth 10 points

Must show all work

1. Decide whether the following relation on the set {1, 2, 3, 4} is reflexive, whether it is symmetric, and whether it is transitive:

{(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)}

[(1,1),(4,4)] not in a pairs

Reflexive: ~~Yes. All elements of set in a re~~ a set
Not because 1 element from a set not in a relation

Symmetric: Not because (2,4) doesn't have pair

Transitive

Yes

a	b	b	c			a c		
2	2	2	2	2 3	2 4	2 2	2 3	2 4
2	3	3	2	3 3	3 4	2 2	2 3	2 4
3	4	none						
3	2	2	2	2 3	2 4	3 2	3 3	3 4
3	3	3	2	3 3	3 4	3 2	3 3	3 4
3	4	none						

Yes, because all ~~elem~~ ac ordered pairs in a relation

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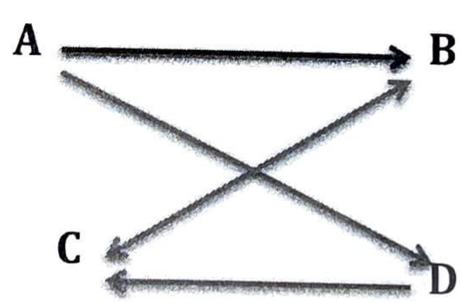
2. List the ordered pairs in the relation represented by the directed graph:



R = {(A,B), (A,D), (D,C)}

(B,C)
(C,B)

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3. Show that the relation ***R*** consisting of all pairs (x, y) such that x and y are bit strings that agree in their first and third bits is an equivalence relation on the set of all bit strings of length 3 or more.

Reflexive: $((x,y)(x,y)) \in R$

Symmetric: $(x,y) \in R \Rightarrow (y,x) \in R$

Transitive: $(x \in R) \wedge (y \in R) \rightarrow (\ \in R)$

So it's equivalence relation

x : □ x Δ   Reflexive: $(x, x) \in R$; xRx (y not need)

y : □ x Δ   Symmetry: $x R y \Rightarrow$ ~~(y, x)~~ yRx

Transitivity: if xRy and $yRz \Rightarrow xRz$

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4. Determine whether the following collections of subsets are partitions of $\{1, 2, 3, 4, 5, 6\}$

Justify your responses.

a. $\{1\}, \{2, 3, 6\}, \{4\}, \{5\}$ It does not consist of empty set $(\emptyset)$. And all elements of set are present in partition

Answer question

b. $\{1, 4, 5\}, \{2, 6\}$

Element of set 3 is not in a partition.

So →

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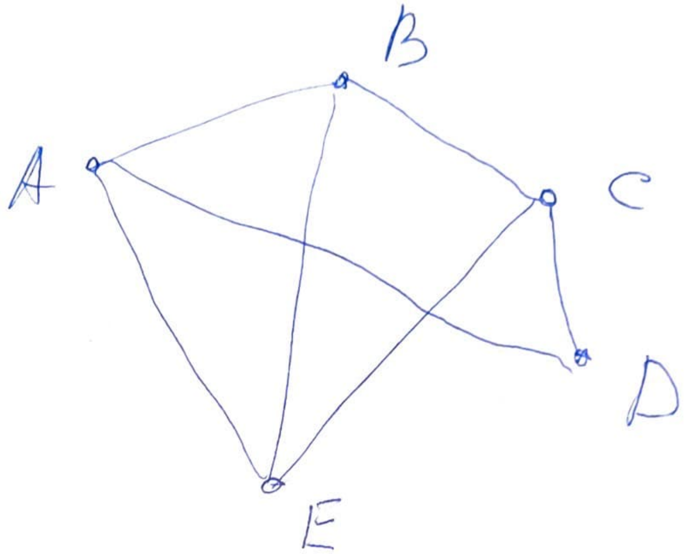
5. The intersection graph of a collection of sets A, B, C, ... has a vertex for each set and has an edge connecting two vertices if their associated sets have a nonempty intersection. Construct the intersection graph for the following collection of sets:

A = {0, 2, 4, 6, 8}
B = {0, 1, 2, 3, 4}
C = {1, 3, 5, 7, 9}
D = {5, 6, 7, 8, 9}
E = {0, 1}

~~A ∪ B = {(0,0) (22) (44) (33) (14)}~~ uCUP



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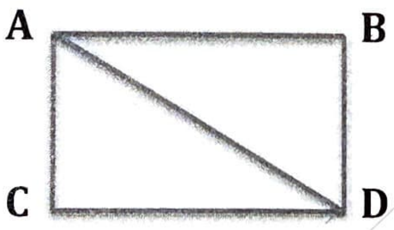
6. Use an adjacency matrix to represent the following graph:
Note: matrix indices should correspond to alphabetical order



4 by 4 because 4 vertices

$$\begin{array}{c|cccc} & A & B & C & D \\ \hline A & \cancel{X} & 1 & 1 & 1 \\ B & 1 & \cancel{X} & \cancel{X} & \cancel{0} \\ C & 1 & 0 & 0 & 1 \\ D & 1 & 1 & 1 & \cancel{X} \end{array}$$

which is it?

$$\begin{array}{c|cccc} & A & B & C & D \\ \hline A & 0 & 1 & 1 & 1 \\ B & 1 & 0 & 0 & 1 \\ C & 1 & 0 & 0 & 1 \\ D & 1 & 1 & 1 & \cancel{X} \end{array}$$

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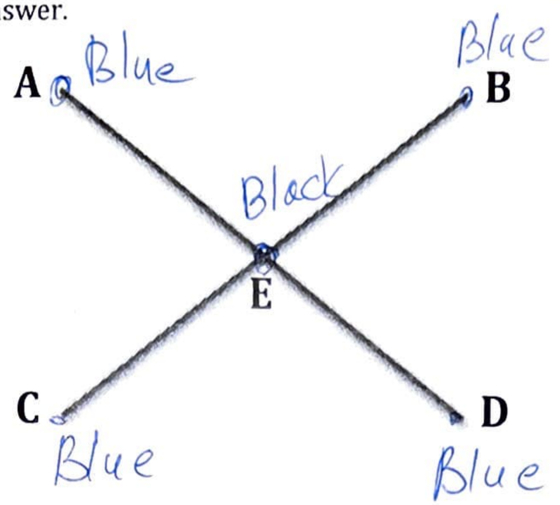
7. Determine whether the following graph is bipartite. Recall that a graph is bipartite if and only if it is possible to assign one of two different colors to each vertex of the graph so that no two adjacent vertices are assigned the same color. Justify your answer.



This graph is bipartite because there is not two the same adjacent colors.

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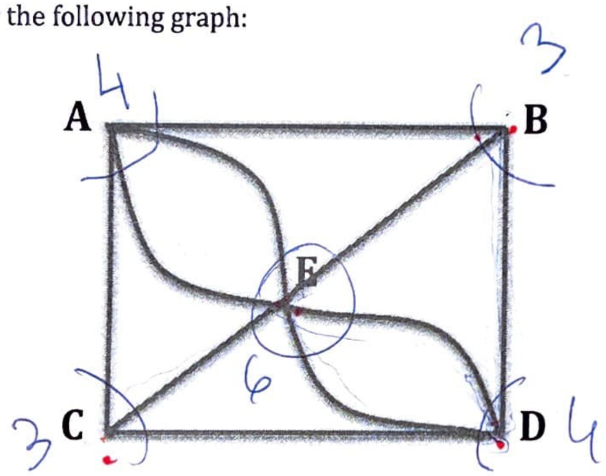
8. Consider the following graph:



a. Does the graph have an Euler circuit? Why/why not?

It doesnot have Euler circuit, because in order to exist it must be even degree on all verteces.

b. Does the graph have an Euler path? If so, provide such a path.

B A C E A E B D E D C

Path is exist because exactly two verticex have odd degree

Path
no circuit

9. Consider the following graph:

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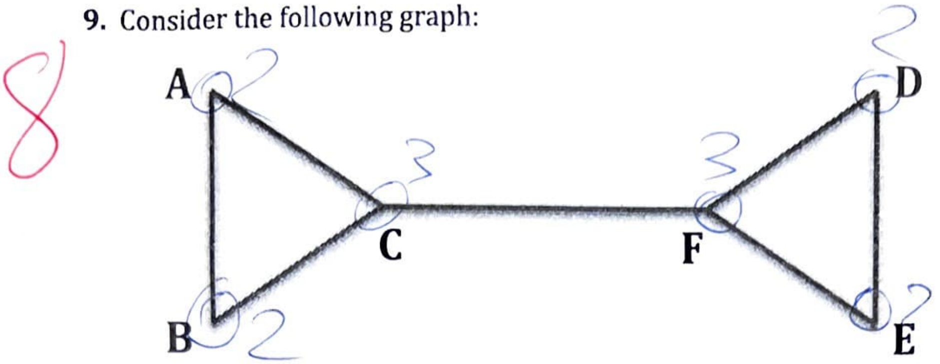
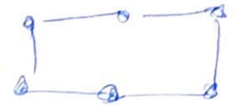


It's not strictly to this condition, because ⇒ 

a. Does the graph have a Hamilton circuit? Why/why not?

There 6 vertexes ($n \geq 3$) ✓ NO

$\frac{6}{2} = 3$ Every vertex should have exactly 3 edges, but not all vertexes have 3 edges

b. Does the graph have a Hamilton path? If so, provide such a path.

Path: A B C F E D
It travel all verteces exactly once

10. Find the shortest path between *A* and *F* in the following weighted graph. What is the total length of this path?

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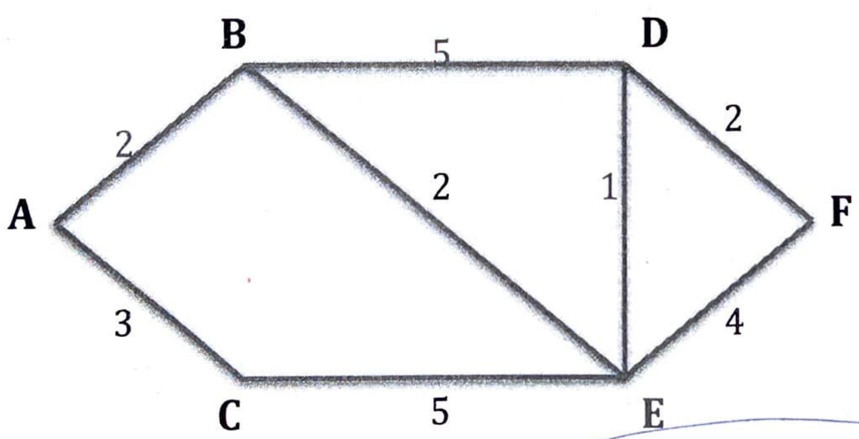

A BED F

{AB} = 2
[ABE] = 4
[ACE] = 8
[ABED] = 5
[ABD] = 7

[ABEDF} = 7
[ACEF] = 12
[ABEF] = 8