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| Question 1 Digraphs  What is a digraph? | Question 2  An adjacency matrix |
| A strongly connected graph | Question 4  Directed Cycles |
| Question 5  outdegrees and indegrees | outdegrees and indegrees |
| ***Question 7:***  R is a relation deﬁned on S in precisely the following cases:  bRb; bRc; cRb; cRc; cRd; dRa.    The relation R is not reﬂexive. Which minimal set of pairs should be added to R to make it reflexive? | ***Question 8***  R is a relation deﬁned on S in precisely the following cases:  bRb; bRc; cRb; cRc; cRd; dRa.  The relation R is not symmetric. Which minimal set of pairs should be added to R to make it symmetric? |
| **Question 9**  R is a relation deﬁned on S in precisely the following cases:  bRb; bRc; cRb; cRc; cRd; dRa.  The relation R is not transitive. Which minimal set of pairs should be added to R to make it transitive? | **Question 10**  R is a relation deﬁned on S in precisely the following cases:  bRb; bRc; cRb; cRc; cRd; dRa.  Is the relation R anti-symmetric? Justify your answer. |
| Relationship digraph  Let S = {a, b, c}.  (i) R is reﬂexive if aRa and bRb.  (ii) If R is symmetric then aRb and bRa.  (iii) If R is anti-symmetric then it is not symmetric.  (iv) If R is not an equivalence relation then it is a partial order. | Question 12 Consider a set S ={0,1,2,3,4,5}.  R1 is the relation such that xR1y if  x-y =2 for all x and y \element S  R1 is reflexive?  T  F  False |
| Question 13 Let R be an equivalence relation on S.  Two elements of S are related if and only if they belong to the different classes.  FALSE | Question 14Consider a set S ={0,1,2,3,4,5}.  R2 is the relation such that xR2y if  x-y is even for all x and y \element S  R2 is symmetric?  T  F  False |
| Question 13 Equivalence Class : Transitive | Question 14 Let R be an equivalence relation on S.  The set of distinct equivalence classes on R on S is a partition of S.  TRUE |
|  | Question 16 |
|  | Question 18  Cartesian Products |
| Question 19 Partial Orders  A relation R on a set S is a partial order if it is reflexive, symmetric and anti-transitive.  False  reflexive, anti-symmetric and transitive. | Question 20  n-bit binary strings |