CS 280 Grading Guide – Assignment 9 – Section 6.1

2. (a) 2 points. If you miss more than half of the ordered pairs in the list you get no points. For any other number of missing ordered pairs, you lose 1 point. If the ordered pairs don't have entries from the given set you get no points.
   (b) 2 points. If you miss more than half of the arrows you get no points. For any other number of missing arrows, you lose 1 point. If you had a mistake in (a) and got a point from (a) and your error propagated in (b) you don't lose points for that. If there are nodes that don't belong to the given set you get no points.
   (c) 2 points. If you miss more than half of the crosses you get no points. For any other number of missing crosses, you lose 1 point. If you had a mistake in (a) and got a point from (a) and your error propagated in (c) you don't lose points for that. If there are entries that don't belong to the given set you get no points.

14. (a) 2 points. If your answer is $R^{-1} = \{ (a,b) \mid a \geq b\}$ you lose 1 point. Any other wrong answer gets no points.
   (b) 2 points. If your answer is "complement of $R = \{ (a,b) \mid a > b\}$" you lose 1 point. Any other wrong answer gets no points.

20. 2 points. If you miss more than half of the ordered pairs in $S \circ R$ you get no points. If you have found $R \circ S = \{(2,2),(2,3),(3,2),(3,3),(3,4),(4,4)\}$ (without any errors) instead of $S \circ R$ you lose a point.

28. (a) 2 points. Writing the definition of reflexive property for each of the relations for $\forall a \in A$ is worth 1 point. Using the definition of union of two sets to show $(a,a) \in R \cup S$, $\forall a \in A$, gets the remaining 1 point.
   (b) 2 points. Writing the definition of reflexive property for each of the relations for $\forall a \in A$ is worth 1 point. Using the definition of intersection of two sets to show $(a,a) \in R \cap S$, $\forall a \in A$, gets the remaining 1 point.
   (e) 2 points. Writing the definition of reflexive property for each of the relations for $\forall a \in A$ is worth 1 point. Using the definition of composition of two relations to show $(a,a) \in S \circ R$, $\forall a \in A$, gets the remaining 1 point.

CS 280 Common Mistakes – Assignment 9 – Section 6.1

14. (a) Replacing all "a"s and "b"s in the definition of R with "b"s and "a"s, respectively, to find the inverse relation. (i.e. $R = \{ (a,b) \mid a > b\} \Rightarrow R^{-1} = \{ (b,a) \mid b > a\}$) However, you again obtain R ! You should switch a and b only within the inequality.
   (b) Missing ordered pairs of type (a,a) in the complement of R. (i.e. $a>b$ instead of $a \geq b$ in the definition of complement of R)

20. Confusing the definition of $S \circ R$ with that of $R \circ S$, using the definition wrongly.

28. In this question, one common mistake was confusing the elements of set A and elements of the given relations. A has only elements of the form such as "a", whereas, R and S has

elements of the form (a,b) (ordered pairs) where a,b$\in$A. So a and b are not elements of R and S.

(a) Only writing the definition of reflexive property for each of the relations for $\forall a \in A$ and concluding R$\cup$S is reflexive without using the definition of union of two sets.

(b) Only writing the definition of reflexive property for each of the relations for $\forall a \in A$ and concluding R$\cap$S is reflexive without using the definition of intersection of two sets.

(e) Only writing the definition of reflexive property for each of the relations for $\forall a \in A$ and concluding SoR is reflexive without using the definition of composition of two relations.

Sections 6.3, 6.4

Each part of a question is worth 2 marks, 20 marks in total.

Qn 4) It was 2 marks for the full answer and 1 mark if you got at least one of the properties correct.
General comments:
It is necessary to state negative properties, e.g. Matrix is not transitive. This time, we assumed that if the property was not stated, then it is absent. However, it's best to state everything.
Most people couldn't get full credit for parts b and c because they did not state that the relation was neither reflexive nor irreflexive. Note: not reflexive is not equivalent to irreflexive.

Qn 10) 2 marks for fully correct answer, 1 mark for partially correct answer.
This was an easy question; most people got full credit for it.

Sec 6.4
Qn 10) 2 marks for fully correct answer, 1 mark for partially correct answer.
Most people got it correct, but some were careless and left out one of the properties. Furthermore, some tried to construct using specific cases, but we were looking for a relation defined on the set of integers.

Qn 26) 2 marks for fully correct answer, 1 mark for partially correct answer.
This question is quite mechanical and most people who weren't careless got the answer.

Section 6.5

10) First, R is a relation on pairs of reals. That means $R \subseteq (\text{Real X Real}) \text{ X } (\text{Real X Real})$. For reflexivity, you needed to show $((a,b),(a,b)) \in R$. For R to be symmetric you needed to show $((a,b),(c,d)) \in R \Rightarrow ((c,d),(a,b)) \in R$. Finally, for reflexivity, you needed to show $((a,b),(c,d)) \in R$ and $((c,d),(e,f)) \in R \Rightarrow ((a,b),(e,f)) \in R$.

16) Only a and c were equivalence relations.
Also, the equivalence class is not a set of pairs. That is, if R is a relation on some set A, then $[a]_R \subseteq A$ (and not A X A). In this particular case, for example, [0] is a subset of {0,1,2,3}.

24) Errors for part a:
not taking into account negative numbers
ignoring (0,0)
Errors for part b: (a,b) is related not only to (na, nb). For example, if a = 10 and b = 20, then (1,2) is also in its equivalence class.

32) a) For reflexivity, there were almost no errors. For symmetry: you cannot invert the operations by reflecting first and then rotating. That is not allowed. For transitivity: you cannot rotate, reflect, and then rotate again. That is not allowed.
32) b) The beads do not have to be all different colors. (other errors were varied, and listing them here would be too long).

Prepared by : OA