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ENS1161 Computer Fundamentals

Test 5   10/10.

(a)   Consider sets A = {a, b, c, d}, B = {e, f, g} and C = {m, p, q}, and relations R between A and B, and S between B and C, defined by:
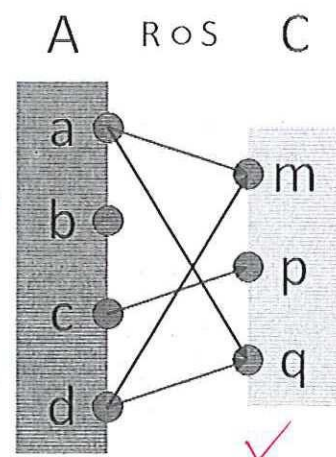
R = {(a, f), (b, e), (c, e), (c, g), (d, f)} and S = {(f, m), (f, q), (g, p)}

(i)   Find matrices M(R) and M(S) that represent R and S,

$$M(R) = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix} \qquad M(S) = \begin{pmatrix} 0 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

(ii)   Find the matrix M(RoS) that represents the composition RoS, and represent the relation RoS with an arrow diagram.

$$M(R \circ S) = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

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(b)   In each of the following, there is a set and a relation defined on that set. For each indicate with "Y" or "N" whether the relation is reflexive, symmetric or transitive, and hence whether it is an equivalence relation.

	Set	Relation	Reflex?	Symm?	Trans?	Equiv?
1	people	lives no more than 1km from	Y	Y	N	N
2	people	likes to play chess with	N	N	N	N
3	students	attends the same class as	Y	Y	Y	Y

(c)   A relation P between sets {k, l} and {r, s, t} is represented by the matrix

$$M(P) = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$$

. Represent the inverse relation P^{-1} as a set of ordered pairs.

$$P^{-1} = \{(r, k), (r, l), (t, k)\} \quad \checkmark$$

[5 + 3 + 2 = 10 marks]

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