

Course No: **ESGD2206**
 Course Title: **Introduction to Discrete Mathematics**
 Date: **18 / 08 / 2011**
 No. of Questions: **4**
 Time: **01.00 hr**
 Using Calculator (**Yes**)

University of Palestine



Final Exam
Summer term 2010/2011
 Total Grade: **60**

Instructor: **Eng. Tasneem Darwish**
 Student No.: _____
 Student Name: _____
 College Name: **Eng. College**
 Dep. / Specialist: **Software Engineering**
 Using Dictionary (**No**)

First Question

(26)

Q1(a): Determine the cardinality of each of the following sets:

- 1) $\{\{a, b, c\}, \{a, b, c\}\}$
- 2) $\{\emptyset, \{\emptyset\}, \{\{\emptyset\}\}\}$

Q1 (b): State whether each of the following statements is true or false.

- (i) $2 \in \{1, 2, 3, 4, 5\}$
- (ii) $\{2\} \in \{1, 2, 3, 4, 5\}$
- (iii) $2 \subseteq \{1, 2, 3, 4, 5\}$
- (iv) $\{2\} \subseteq \{1, 2, 3, 4, 5\}$

Q1 (c): prove that $A \subseteq B$:

$$A = \{x : 2x^2 + 5x = 3\}$$

$$B = \{x : 2x^2 + 17x + 27 = 18/x\}$$

Q1(d) : Draw Venn diagrams and shade the regions representing each of the following sets:

- 1) $(A \cup B) - C$
- 2) $(A \cap B) \cup \overline{(A \cup B)}$

Q1 (e): Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Determine whether each of the following is a partition of A.

- (i) $\{1, 2, \{3, 4\}, \{5, 6\}, \{7, 8\}, \{9, 10\}\}$
- (ii) $\{\{1, 2\}, \{3, 4\}, \{5, 6\}, \{7, 8\}, \{9, 10\}\}$
- (iii) $\{\{1, 3, 5, 7, 9\}, \{2, 4, 8\}, \{10\}\}$
- (iv) $\{\{1, 5\}, \{2, 6, 10\}, \{3\}, \{4, 7, 9\}, \{8\}\}$
- (v) $\{\{2, 8, 10\}, \{1, 6\}, \{3, 4, 5\}, \{7, 8, 9\}\}$.

Q1 (f): list the elements of $X \times Y$, where $X = \{(1, 2)\}$ $Y = \{a, b, c, d, e\}$.

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Second Question

(26)

Q2 (a): let $A = \{1, 2, 3, 6, 7, 8\}$;

$a R b$ if and only if $a < b$.

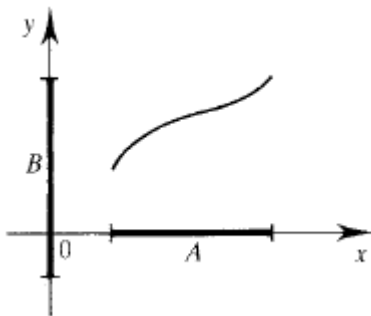
1) For the relation R on a set A, draw:

- i) its coordinate grid diagram
- ii) its directed graph
- iii) Its binary matrix
- iv) Arrow diagram

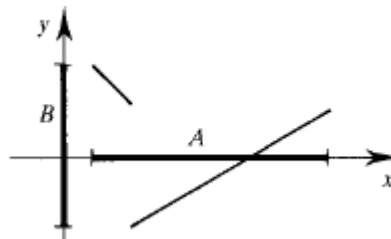
2) Is R an equivalence relation? Explain your answer.

3) what are the equivalence classes of R?

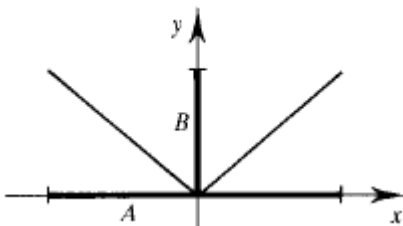
Q2 (b): Each of the following is the graph of a function $A \rightarrow B$. Determine whether or not each function is injective and/or surjective.



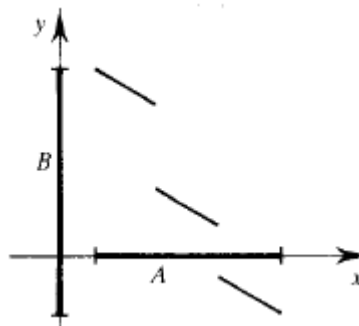
(i)



(ii)



(iii)



(iv)

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Third Question

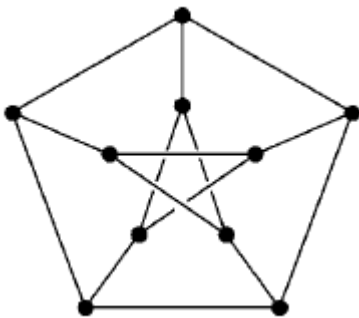
(8)

Q3 (a): Draw diagrams to represent the complete graphs K3 and K4

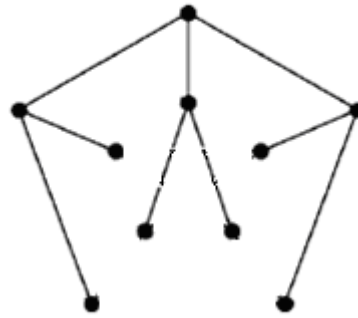
Q3 (b): the following is an adjacency matrix of a graph, determine whether the corresponding graph is Eulerian.

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

Q3 (c): which of the following is a tree?



(i)



(ii)

Fourth Question

5 Bonus Marks

Using mathematical induction Prove that, for all positive integers n

$$1 + 2 + \dots + n = \frac{1}{2}n(n + 1)$$

Good Luck