

Second Midterm Exam
Academic Year 1445-1446 Hijri- First Semester

Exam Information معلومات الامتحان		
Course name	الرياضيات المتقطعة	اسم المقرر
Course Code	151 رياض	رمز المقرر
Exam Date	2023-11-16	1445-05-02 تاريخ الامتحان
Exam Time	03: 00 PM	وقت الامتحان
Exam Duration	2 hours	مدة الامتحان
Classroom No.		رقم قاعة الاختبار
Instructor Name		اسم استاذ المقرر

Student Information معلومات الطالب		
Student's Name		اسم الطالب
ID number		الرقم الجامعي
Section No.		رقم الشعبة
Serial Number		الرقم التسلسلي

General Instructions:

- Your Exam consists of 7 PAGES (except this paper)
- Keep your mobile and smart watch out of the classroom.
- Calculators are not allowed.

- عدد صفحات الامتحان 7 صفحة. (باستثناء هذه الورقة)
- يجب إبقاء الهواتف والساعات الذكية خارج قاعة الامتحان.
- يمنع استخدام الآلة الحاسبة.

هذا الجزء خاص بأستاذ المادة
This section is ONLY for instructor

#	Course Learning Outcomes (CLOs)	Related Question (s)	Points	Final Score
1	C.L.O 1.1	I		
2	C.L.O 1.2	II		
3	C.L.O 2.2	III		
4	C.L.O 2.3	IV		
5				
6				
7				
8				

Question	I	II	III	IV	Total
Mark					

Question I: (0.5×8=4points)

Question	1	2	3	4	5	6	7	8
Answer								

Choose the correct answer, then fill in the table above:

(1) If R is a symmetric relation on a set A , then the inverse relation, R^{-1} , is also symmetric

- (a) True
- (b) False

(2) Let $R = \{(x, y): y = 2x + 1\}$, and $S = \{(x, y): y = x^2\}$. Where R and S are defined on \mathbb{Z} , then $R \circ S$ is defined as

- (a) $\{(x, y): y = (2x + 1)^2\}$.
- (b) $\{(x, y): y = (2x + 1)x^2\}$.
- (c) $\{(x, y): y = 2x^2 + 1\}$.
- (d) None of the previous.

(3) In the set of positive integers with division relation $(\mathbb{Z}^+, |)$, 4 and 8 are:

- (a) comparable
- (b) incomparable

(4) If R_1 and R_2 are relations on a set A represented by the matrices

$$M_{R_1} = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix} \text{ and } M_{R_2} = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}, \text{ then } M_{R_1 \cap R_2} =$$

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

(b) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$

- (d) None of the previous

(5) For the equivalence relation on \mathbb{Z} defined by $aRb \leftrightarrow a \equiv b \pmod{3}$, \mathbb{Z} can be partitioned

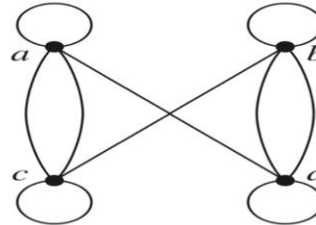
- (a) $\{[0],[1],[3]\}$.
 - (b) $\{[-1],[0],[1],[2]\}$.
 - (c) $\{[-1],[0],[1]\}$.
 - (d) None of the previous.
-

(6) The number of edges of the 20 – *regular* graph with 10 vertices graph is:

- (a) 180.
 - (b) 100.
 - (c) 90.
 - (d) None of the previous.
-

(7) For the graph below, the degree of the vertex a is

- (a) 4.
- (b) 3.
- (c) 5.
- (d) None of the previous.



(8) Which of the following graphs is a **disconnected** graph?

- (a)
 - (b)
 - (c)
 - (d)
-

Question II: (1.5+5.5=7points)

A. For the partial ordered set on $A = \{1, 2, 3, 4\}$, given by:

$$S = \{(1,1), (1,2), (1,3), (1,4), (2,2), (2,4), (3,3), (3,4), (4,4)\},$$

draw the Hasse diagram representing the relation S . Is the poset a totally ordered set? Justify your answer.

B. Let R be a relation on $A = \{1, 2, 3, 4\}$, defined by

$$aRb \leftrightarrow a + b \text{ is prime.}$$

Then answer the following:

(i) List all ordered pairs of R .

(ii) Draw a directed graph (digraph) representing the relation R .

(iii) Is the relation R reflexive? Justify your answer.

(iv) Is the relation R antisymmetric? Justify your answer.

Question III: (4.5+1.5+1=7points)

Let R be a relation defined on the set of integers \mathbb{Z} by $R = \{(a, b) : a^2 = b^2\}$. Then answer the following:

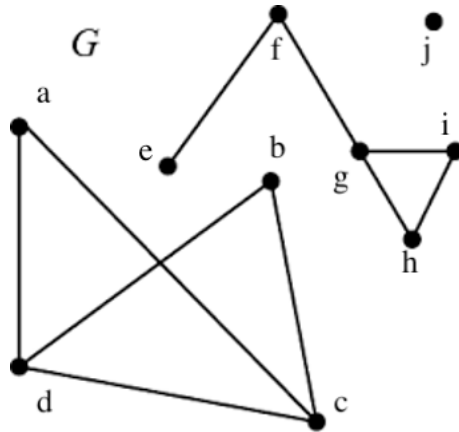
(i) Prove that R is an equivalence relation on \mathbb{Z} .

(ii) Find the equivalence classes $[x]$ and $[5]$.

(iii) Is the relation R a partial ordered set on \mathbb{Z} ? Justify your answer.

Question IV: (2.5+3+1.5=7points)

A. Answer the following questions about the graph G :



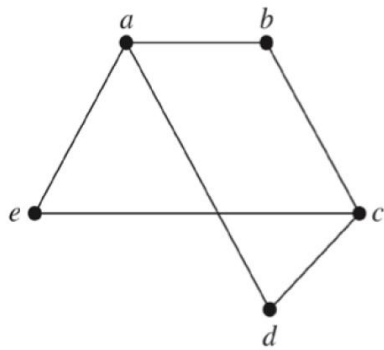
(i) Is the graph G connected? Justify your answer.

(ii) How many connected components are in the graph G .

(iii) Find a path from i to e of length 4.

(iv) Does the graph have an isolated vertex? If so, name it.

B. Answer the following questions about the graph J below

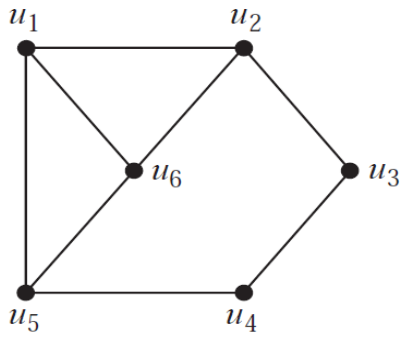


J

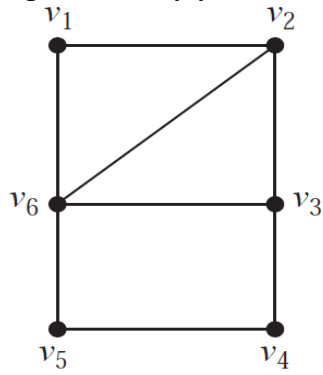
(i) Is the graph J bipartite? Justify your answer.

(ii) Represent the graph J in an **adjacency matrix**.

C. Are the graphs H and I below isomorphic? Justify your answer.



H



I

Good Luck 😊