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## 離散數學期末考

1 封郵件

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2021年6月24日 上午10:56

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以下是我們收到的回覆。

## 離散數學期末考

全部皆為單選題，共20題，一題5分。

考試時間：6/24 9:00~12:00

考試時請使用NCKU G Suite的google帳號

並且表單輸入的電子郵件也請使用NCKU G Suite的google帳號

電子郵件 \*

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您的學號 \*

F74086129

1. How many following statements are true?

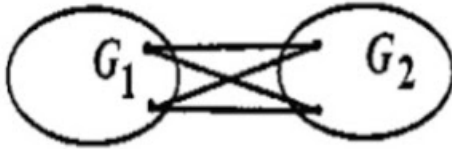
a) There exists a simple graph with 6 vertices, whose degrees are 2,2,2,3,4,4.

b) There exists a simple graph with 6 vertices, whose degrees are 0,1,2,3,4,5

c) There exists a simple graph with degrees 1,2,2,3

d) A graph containing an Eulerian circuit is called an Eulerian graph. If  $G_1$  and  $G_2$

Are Eulerian graph, and we add the following edges between them, then resulting graph is Eulerian.



☐ 0

☐ 1

☒ 2

☐ 3

2. How many way are there to distribute  $m > 0$  distinct object into 2 identical containers with no container left empty?

$$2^{m-1} - 1$$

☒ a)

$$(m!/2) - m^2$$

☐ b)

$$\frac{\sum_{i=0}^m \binom{i}{2}}{m}$$

☐ c)

☐ d) None of above

3. How many statements are correct?

$$15843_{10} = 11110111100011_2$$

$$15843_{10} = 36743_8$$

$$15843_{10} = 3de3_{16}$$

☐ 1

☐ 2

☒ 3

☐ None of above

## 4. True or False?

For any  $n \in \mathbb{Z}^+$ , integers  $8n + 3$  and  $5n + 2$  are relatively prime.

- ☒ True
- ☐ False

## 5.

Let  $a, b \in \mathbb{Z}$  so that  $2a + 3b$  is a multiple of 17. (For example, we could have  $a = 7$  and  $b = 1$ , and  $a = 4$ ,  $b = 3$  also works.) determine following statement.

17 also divides  $9a + 5b$ ?

- ☒ True
- ☐ False

6. Among the 900 three-digit integers (from 100 to 999) those such as 131, 222, 303, 717, 848, and 969, where the integer is the same whether it is read from left to right or from right to left, are called palindromes. Without actually determining all of these three-digit palindromes, we would like to determine their sum. Please calculate the sum of these palindromes ranging from 100 to 999.

- ☐ 48500
- ☐ 49000
- ☒ 49500
- ☐ 50500

## 7. Determine the following statement true or false.

For all  $n \in \mathbb{Z}^+$ ,  $\sum_{i=1}^n i = 1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$ .

☒ True

☐ False

8. How many bijective functions are there from a finite set A to a finite set B where  $|A| = |B| = n$ ?

☐ A) 1

☐ B) n

$$n^n$$

☒ C) n!

☐ D)

9. How many functions  $f: A \rightarrow B$  are there where A and B are finite sets with  $|A|=m$  and  $|B|=n$ ?

$$m! n!$$

☐ A)

$$\frac{m!}{(m-n)!}$$

☐ B)

$$m^n$$

☐ C)

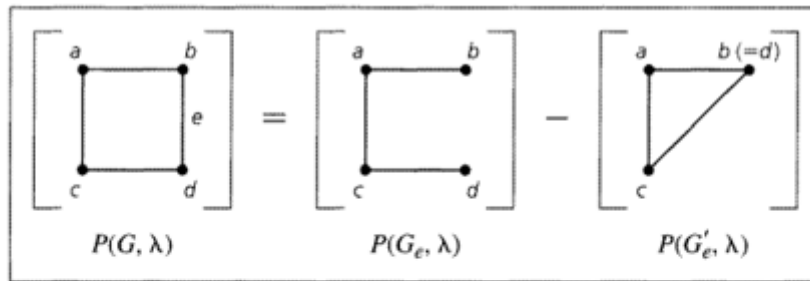
$$n^m$$

☒ D)

10. An undirected graph (or multigraph) where each vertex has the same degree is called a regular graph. If  $\deg(v) = k$  for all vertices  $v$ , then the graph is called  $k$ -regular. Is it possible to have a 4-regular graph with 10 edges?

- ☒ Possible
- ☐ Impossible
- ☐ I can't know the answer through the information of statement of this question
- ☐ The assumption of this question is unreasonable

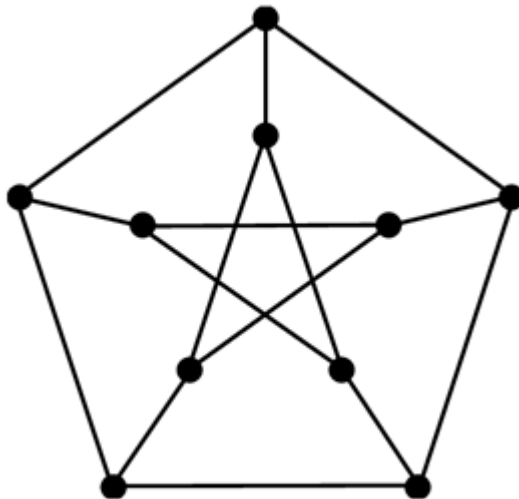
11. The following calculations yield  $P(G, \lambda)$  for  $G$  a cycle of length 4.



$P(G_e, \lambda) = \lambda(\lambda - 1)^3$ . With  $G'_e = K_3$  we have  $P(G'_e, \lambda) = \lambda(\lambda - 1)(\lambda - 2)$ . Therefore,  $P(G, \lambda) = \lambda(\lambda - 1)^3 - \lambda(\lambda - 1)(\lambda - 2) = \lambda(\lambda - 1)[(\lambda - 1)^2 - (\lambda - 2)] = \lambda(\lambda - 1)(\lambda^2 - 3\lambda + 3) = \lambda^4 - 4\lambda^3 + 6\lambda^2 - 3\lambda$  (Please select the true statement of the remaining calculation process)↵

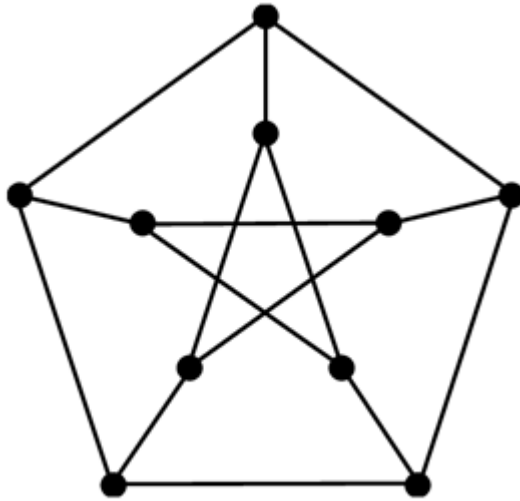
- ☐ Since  $P(G, 1) = 0$ ,  $P(G, 2) = 0$  and  $P(G, 3) = 2 > 0$ , we know that  $\chi(G) = 3$
- ☐ Since  $P(G, 1) = 2$ , we know that  $\chi(G) = 2$
- ☒ Since  $P(G, 1) = 0$  while  $P(G, 2) = 2 > 0$ , we know that  $\chi(G) = 2$
- ☐ Since  $P(G, 1) = 0$  while  $P(G, 2) = 3 > 0$ , we know that  $\chi(G) = 3$

12. Is there a Hamilton path in the following graph?



- ☒ Yes
- ☐ No
- ☐ I can't know the answer through the information of this graph
- ☐ Hamilton path is not a proper noun in graph theory

13. Is there a Hamilton cycle in the following graph?



- ☐ Yes
- ☒ No
- ☐ I can't know the answer through the information of this graph
- ☐ Hamilton cycle is not a proper noun in graph theory

14. What is Euler trail?

- ☐ An Euler trail in a digraph (or graph) is a trail containing all vertices
- ☐ An Euler trail in a digraph (or graph) is a trail containing all vertices and edges
- ☒ An Euler trail in a digraph (or graph) is a trail containing all edges
- ☐ An Euler trail in a digraph (or graph) is a trail containing partial edges

15. What is Euler circuit?

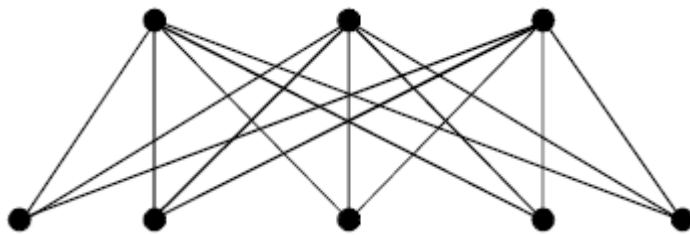
- ☐ An Euler circuit is a open trail containing partial edges
- ☐ An Euler circuit is a open trail containing all edges
- ☐ An Euler circuit is a closed trail containing partial edges
- ☒ An Euler circuit is a closed trail containing all edges



16. What is the difference between Euler trail and Euler circuit?

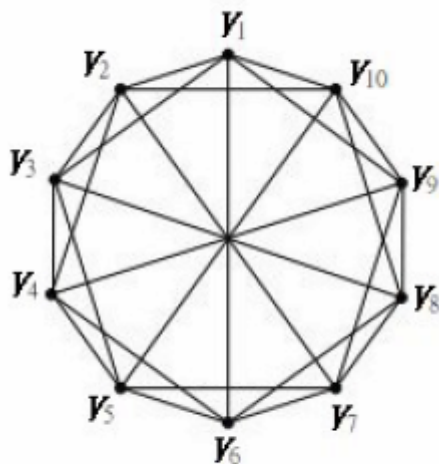
- ☐ These are the same noun
- ☒ One is a open or closed trail, the other is only a closed trail
- ☐ One is trail containing partial edges, the other is trail containing all edges
- ☐ Euler circuit is a path while Euler trail is a walk

17. Is there a Euler trail in the following graph?

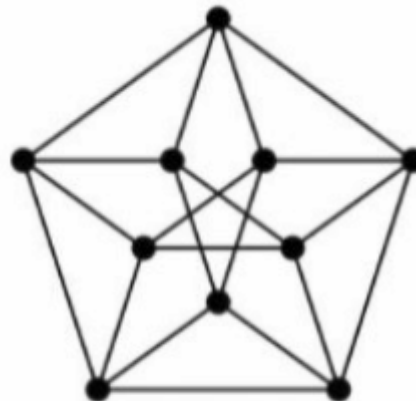


- ☐ Yes
- ☒ No
- ☐ I can't know the answer through the information of this graph
- ☐ Euler trail is not a proper noun in graph theory

18. Are the figure(a) and figure(b) isomorphic?



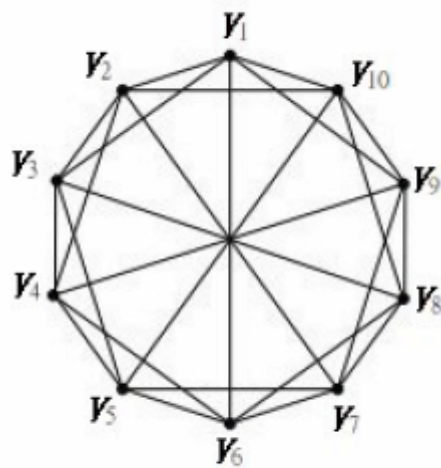
**figure(a)**



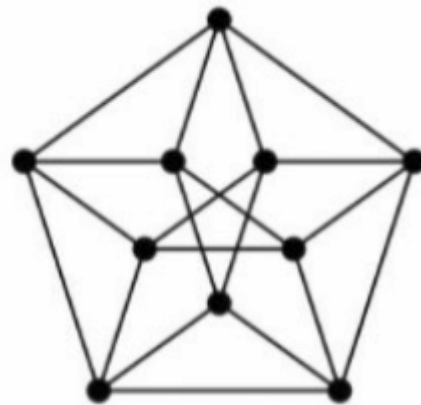
**figure(b)**

- ☐ Yes  
☒ No  
☐ I can't know the answer through the information of this graph  
☐ Isomorphism is not a proper noun in graph theory

19. What is the chromatic number of figure(a) and figure(b)?



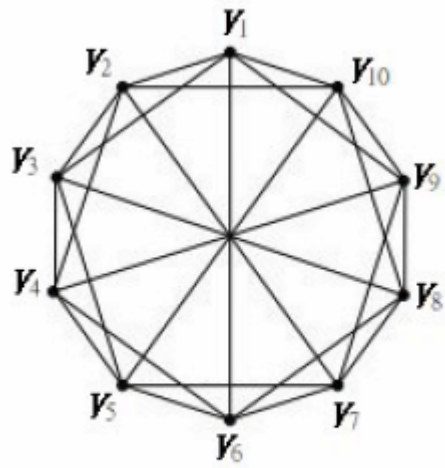
**figure(a)**



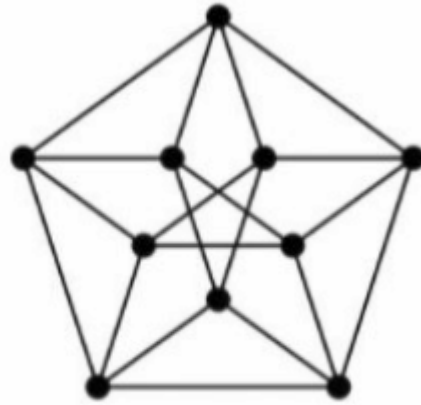
**figure(b)**

- ☐ 3, 3  
☐ 3, 4  
☐ 4, 3  
☒ 4, 4  
☐ 4, 5  
☐ 5, 4  
☐ 5, 5

20. Is there a Euler circuit in these graphs?



figure(a)



figure(b)

- ☐ figure(a) Yes, figure(b) No
- ☐ figure(a) Yes, figure(b) Yes
- ☒ figure(a) No, figure(b) Yes
- ☐ figure(a) No, figure(b) No

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