NATIONAL UNIVERSITY OF SINGAPORE

CS1231S – DISCRETE STRUCTURES

(Semester 1: AY2022/23)

Final Assessment Answer Sheet

Time Allowed: 2 Hours

INSTRUCTIONS

1. Write your **Student Number** on the right AND, using pen or pencil, shade the corresponding circle **completely** in the grid for each digit or letter. DO NOT WRITE YOUR NAME!

2. Zero mark will be given if you write/shade your Student Number incompletely or incorrectly.

3. Write your Student Number at the top of pages 3 and 5.

4. This answer sheet comprises **SIX (6) pages**.

5. All questions must be answered in the space provided; no extra sheets will be accepted as answers.

6. You must submit only this **ANSWER SHEET** and no other documents.

7. An excerpt of the question may be provided to aid you in answering in the correct box. It is not the exact question. You should still refer to the original question in the question paper.

8. You may write your answers using pencil (at least 2B) or pen as long as it is legible (no red ink, please).

9. The maximum mark for this paper is 100.

10. **Marks may be deducted** for (i) illegible handwriting, and/or (ii) excessively long explanations.

11. Each multiple choice question is intended to have only one answer. Shade the appropriate bubbles <u>using pencil only</u>.

For Examiner's Use Only		
Question	**Marks**	**Remarks**
Q1-20	/ 40	
Q21	/ 4	
Q22	/ 20	
Q23	/ 20	
Q24	/ 10	
Q25	/ 6	
Total	**/ 100**	

Part A: Multiple Choice Questions (Total: 40 marks)

Please shade only ONE bubble for each question. <u>Please use ONLY pencil to shade</u>.

	(A)	(B)	(C)	(D)	(E)
1.	○	○	○	○	○
2.	○	○	○	○	○
3.	○	○	○	○	○
4.	○	○	○	○	○
5.	○	○	○	○	○
6.	○	○	○	○	○
7.	○	○	○	○	○
8.	○	○	○	○	○
9.	○	○	○	○	○
10.	○	○	○	○	○
11.	○	○	○	○	○
12.	○	○	○	○	○
13.	○	○	○	○	○
14.	○	○	○	○	○
15.	○	○	○	○	○
16.	○	○	○	○	○
17.	○	○	○	○	○
18.	○	○	○	○	○
19.	○	○	○	○	○
20.	○	○	○	○	○
	(A)	(B)	(C)	(D)	(E)

Part B (Total: 60 marks)

21. **Mathematical induction.** [4 marks]

1. For each $n \in \mathbb{N}$, let $P(n)$ be the proposition $\sum_{i=0}^{n} f_i^2 = f_n f_{n+1}$.

Therefore, $\forall\, n \in \mathbb{N}\ P(n)$ is true by Mathematical Induction.

22. **Counting and probability.** [20 marks]

(a) [2]

(b) [2]

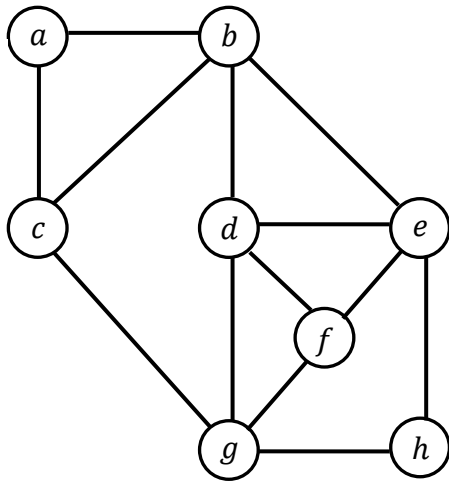(c) [2]

(d) [2]

(e) [2]

(f) (i) [3]

(ii) [2]

(g) (i) [2]   (ii) [3]

23. **Graphs and trees.** [20 marks]

(a)
[2]

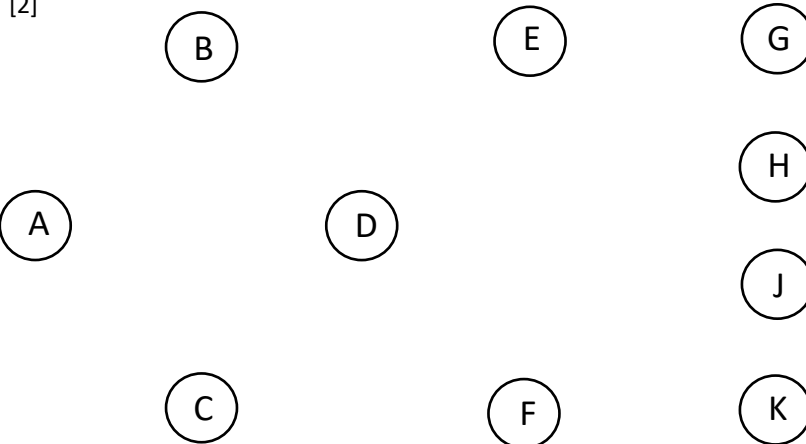G:

(b)
[2]

(c)
[2]

(d)
[2]

(e)
[2]

(f) The vertices represent
[3]

Two vertices are adjacent when
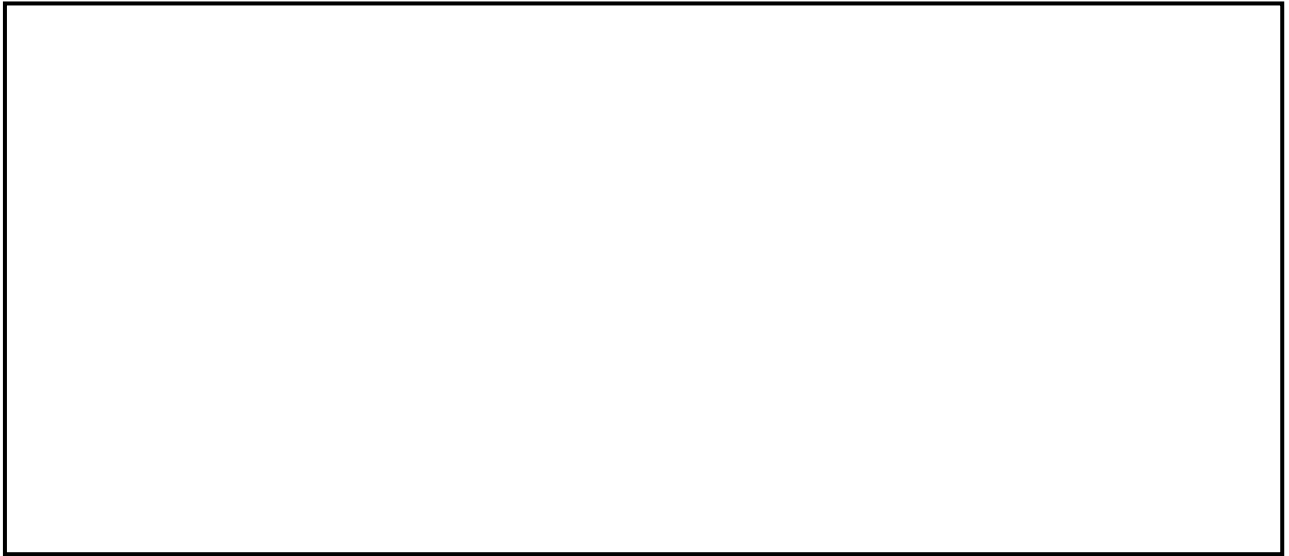
Vertices of the same colour

(g) & (h)
[3]   [2]

B   E   G

                      H

A   D

                      J

C   F   K

(i)
[2]

24. **Functions and relations.** [10 marks]

(a)
[2]

(b)
[3]

(c)
[5]

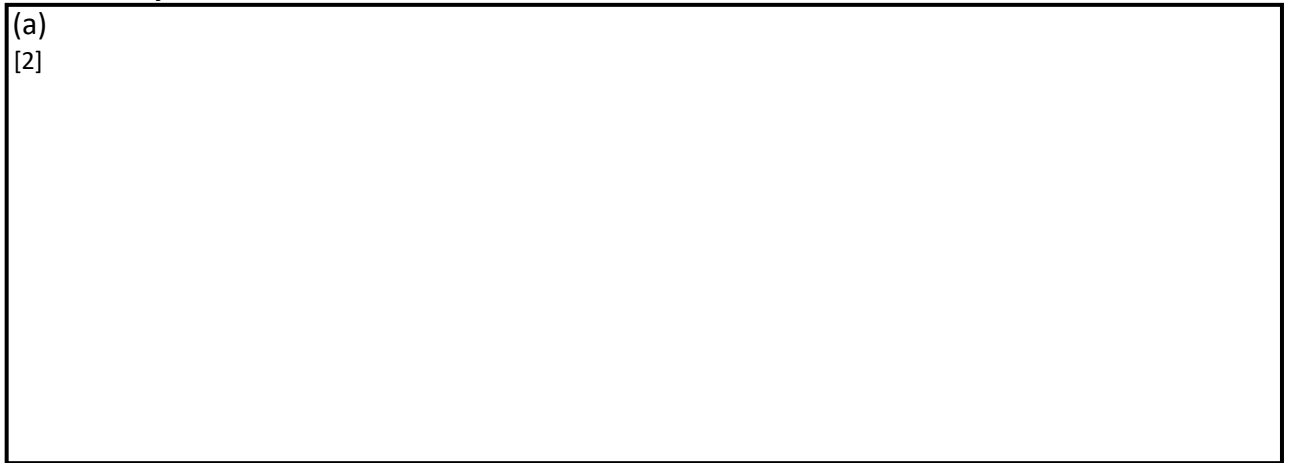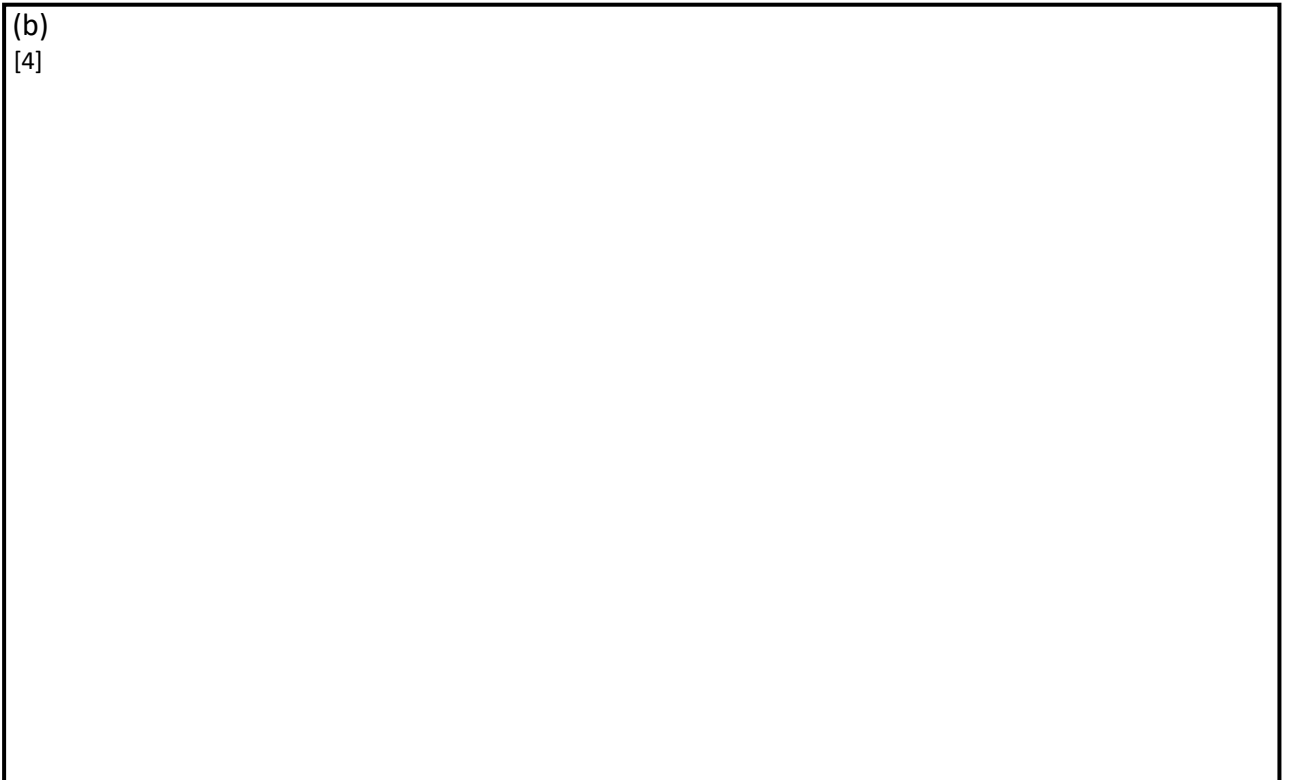(Continue on to next page if necessary.)   Page **5** of **6**

25. **Cardinality.** [6 marks]

(a)
[2]

(b)
[4]

=== END OF PAPER ===