COMP2012 (Fall 2022) Discrete Mathematics

Quiz 2. 10:00pm-11:00pm, 28th October 2022

Name: ___ZHOU Siyu_____ Student ID: _____ Marks: _____ / 100

- This is an **individual** quiz.
- Please submit the **soft copy** of your answer to Blackboard (as a doc/docx/pdf file).

Question 1 **[50 marks]**

1(a) A standard 52 card deck has 13 cards for each suit. Individual cards are ranked, from highest to lowest: A, K, Q, J, 10, 9, 8, 7, 6, 5, 4, 3 and 2. A full-house pattern contains five cards, in which three cards of one rank and two cards of another rank.

(i) **Draw** the cards (suits & ranks only) of any one **Full-house** pattern (5 marks)

(ii) With steps and explanations, tell us the number of possible full-house patterns. (15 marks)

1(a)

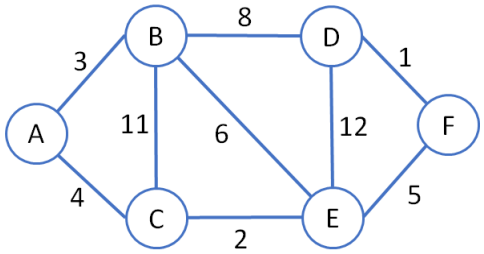
(i) (i) A♢ K♢ 5♢ 3♡ 2♡

(ii)

.$P(4,2) \times C(13,3) \times C(13,2) = 267692$

Firstly, we should arrange 2 ranks from 4 ranks in order, so we should use permutation, P(4, 2). Then, we choose three cards from one rank, and two cards from one rank, so we use C(13,3) and C(13,2). And according to product rule of counting principle, we multiply them together and get the result of possible full-house patterns.

1(b) Given an undirected & weighted graph *G* below. Start from vertex A, with *Dijkstra's Algorithm* find out the list of extracted vertices in order. (25 marks)



1(c) In accordance to the question **1(b)**, write down the lowest-cost path from A to F. (5 marks)

1(b)

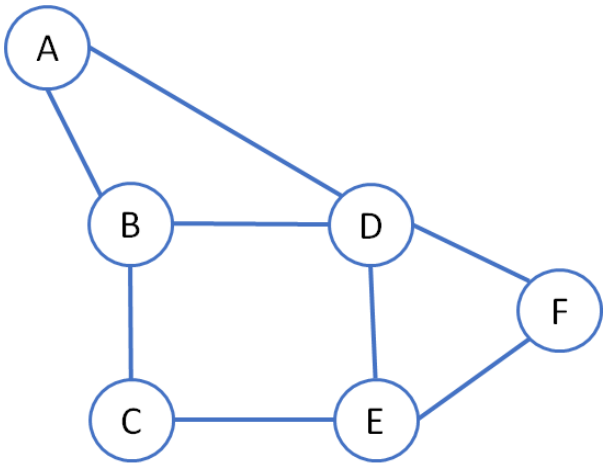
[Initialization] Q = (A: 0), (B: ∞),(C, ∞), (D, ∞), (E, ∞), (F, ∞)
[Iteration 1] Extract vertex A, update vertices B, C
A: d = 0
Q = (B: 3), (C: 4), (D, ∞), (E, ∞), (F, ∞)
[Iteration 2] Extract vertex B, update vertices C, D, E
A: d = 0, B: d = 1
Q = (C: 4), (D, 11), (E, 9), (F, ∞)
[Iteration 3] Extract vertex C, update vertices E
A: d = 0, B: d = 1, C: d = 1
Q = (D, 11), (E, 6), (F, ∞)
[Iteration 4] Extract vertex E, update vertices F
A: d = 0, B: d = 1, C: d = 1, E: d = 2
Q = (D, 11), (F, 11)
[Iteration 5] Extract vertex D, update vertices F
A: d = 0, B: d = 1, C: d = 1, E: d = 2, D: d = 3
Q = (F, 11)
[Iteration 6] Extract vertex F, update vertices C, D, E
A: d = 0, B: d = 1, C: d = 1, E: d = 2, D: d = 3, F: d = 4
Q = ∅

list of extracted vertices in order: A, B, C, E, D, F

1(c) A to C to E to F

Question 2 **[50 marks]**

Given the graph *H* below:



2(a) Determine the adjacency matrix of the graph *H*. (20 marks)

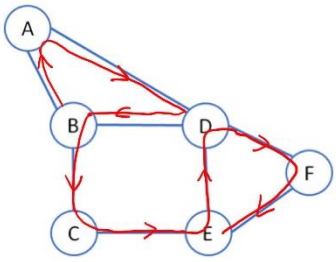
2(b) Does the graph *H* contains an Euler path? If yes, show such path. If not, add edge(s) to make the graph *H* contains an Euler path and show such path. (15 marks)

2(b) Add edge(s) to make the graph *H* to have an Euler circuit. List the vertices of the circuit in sequence of visit. (15 marks)

2(a)

u\v	A	B	C	D	E	F
A	0	1	0	1	0	0
B	1	0	1	1	0	0
C	0	1	0	0	1	0
D	1	1	0	0	1	1
E	0	0	1	1	0	1
F	0	0	0	1	1	0

2(b)
Yes



2(c)
edge(E,B)
B, A, D, B, C, E, D, F, E, B

End of Quiz 2