Department of Computer Science FAST NUCES (KARACHI CAMPUS)	CS211 – Discrete Structures Fall 2019 Semester

ASSIGNMENT # 2

Read Carefully:

- Assignment **2**has **10** questions that you have to answer and submit in ***HANDWRITTEN*** form.
- The deadline for this assignment is on or before **20-Nov-2019**
- **WARNING**: This is individual assignment; you must solve it by yourself. Any form of plagiarism will result in receiving ZERO in the assignment.
- **WARNING**: Late submission will not be accepted. Any assignment submitted after the cut-off time will receive **ZERO**.
- **WARNING**: Do not alter the sequence of questions and *illegitimate handwriting* is not acceptable.

Problem#1 [8x2 points]

A rider is travelling from shahra-e-faisal to lucknow society to deliver an order. He needs to reach the destination in no more than 30 minutes.

He has limited fuel so it is necessary to stop at some petrol pump in order to refill. He can take following available routs.

R1- Use EBM Causway to reach Brooks chowrangi and then reach the destination via industrial area road.

R2- Use EBM Causway to reach Brooks chowrangi and then straight to attock petrol pump. Then using Korangi road to the destination.

R3- Use Shaheed-E-millat Express Way to reach attock petrol pump then using Korangi road to the destination.

Distances between these points are given in table below.

Location A	Location B	Distance
Shahra-e-Faisal	Attock Pump	8.5km
Shahra-e-Faisal	Brooks	4.8km
Brooks	Attock Pump	2.1km
Attock Pump	Destination	1.3km
Brooks	Destination (via Industrial area)	4.5km
Brooks	Destination (Directly)	3.3km

Question-1: Represent this scenario using a connected graph.

Question-2: Determine whether the relation represented by the digraph are OR aren't reflexive, irreflexive, symmetric, antisymmetric, and/or transitive along with the *reason.*

Question-3: Determine if relation is equivalence and/or partial order.

Question-4: Find Simple Circuit and Simple path if possible.

Question-5: Find if it has Euler or Hamiltonian Circuit and/or Path?

Question-6: Find the shortest path using Dijkstra Algorithm.

Question-7: It the shortest path suitable in above scenario? If not, what is the alternative shortest path?

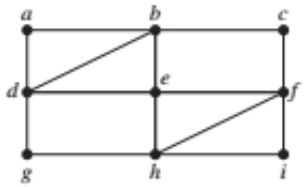
Question-8: Calculate the cost of alternative shortest path, write it in wordsafter applying floor function and then encrypt this using Caesar cipher.

Problem#2 [6x2 points]

In **Exercises 1–6** determine whether the given graph has anEuler circuit. Construct such a circuit when one exists. Ifno Euler circuit exists, determine whether the graph has anEuler path and construct such a path if one exists.

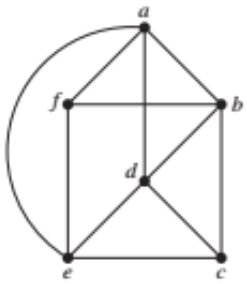
1.

2.

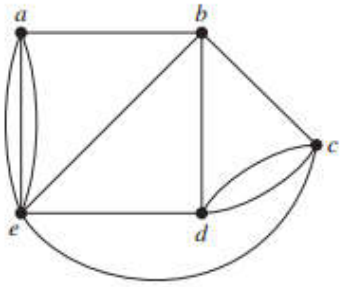


3.

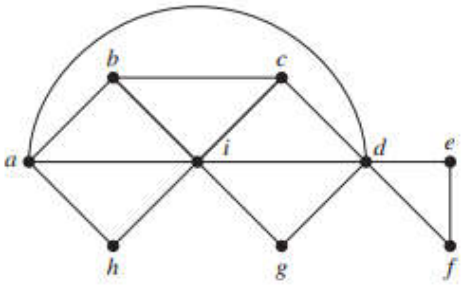
4.



5.

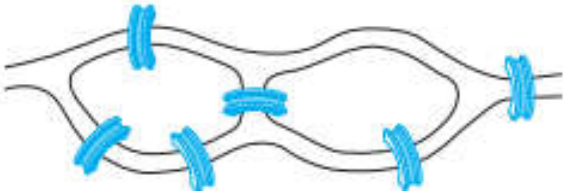


6.



Problem#3 [2 points]

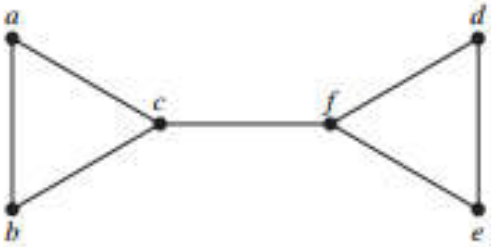
Can someone cross all the bridges shown in this map exactly once and return to the starting point?



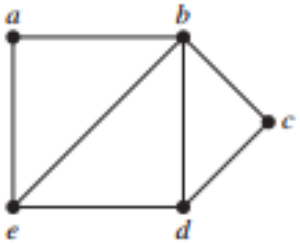
Problem#4 [4 points]

In **Exercises 1–4** determine whether the given graph has aHamilton circuit. If it does, find such a circuit. If it does not,give an argument to show why no such circuit exists.

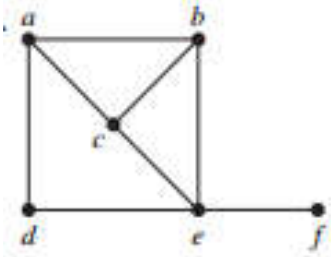
1.



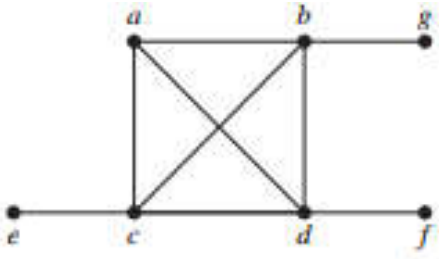
2.



3.



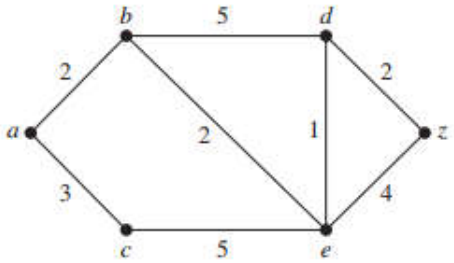
4.



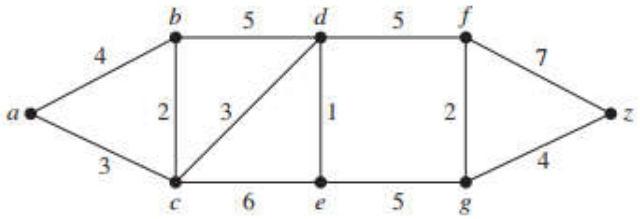
Problem#5 [6 points]

In Exercises **2–4** find the shortest path between *a*and*z and its length* in the given weighted graph.

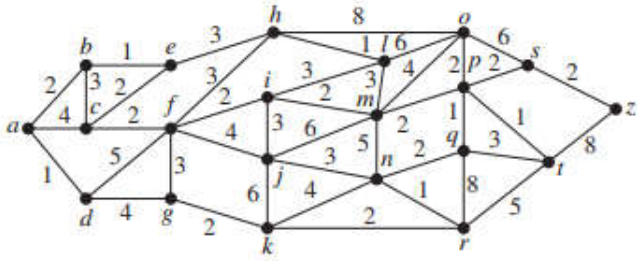
2.



3.



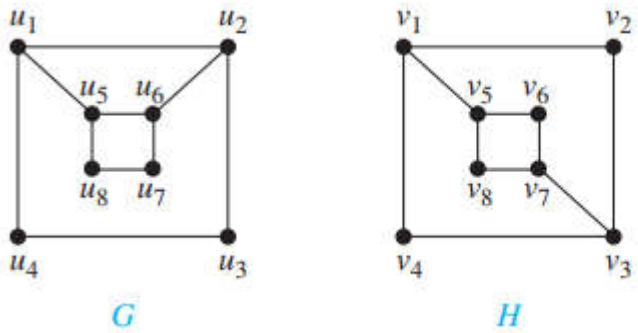
4.



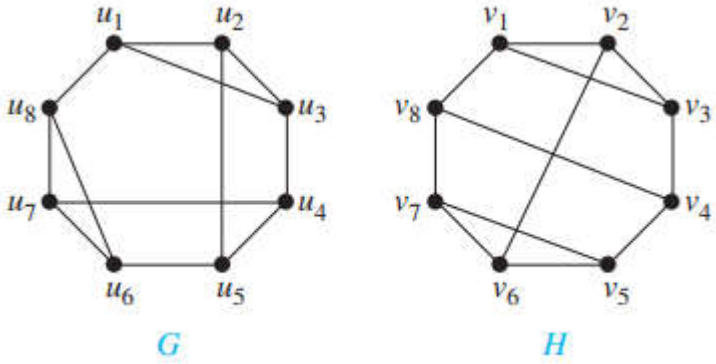
Problem#6 [6 points]

In **Exercise 1-3**Use paths either to show that these graphs are not isomorphic or to find an isomorphism between them.

1.

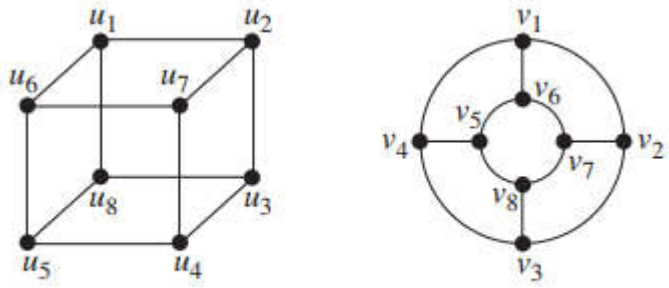


2.



G *H*

3.



G *H*

Problem#7 [4x2 points]

Q. Solve the following linear congruence equations.

(a) $3x \equiv 5 \pmod 7$

(b) $5x \equiv 4 \pmod 7$

(c) $2x \equiv 1 \pmod 7$

(d) $6x \equiv 3 \pmod 7$

Problem#8 [3x2 points]

Q. Use Euclid's algorithm to compute the greatest common divisors of the below expression.

(a) 27 mod 70

(b) Using your work from part (a), find bezout's coefficients such that gcd(a,b) = sa + tband also the inverse such that āa≡ 1(mod m).

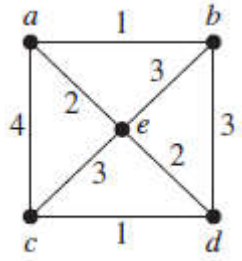
(c) Using your work from part (b), solve the following linear congruence equation.

27x = 4 mod 70.

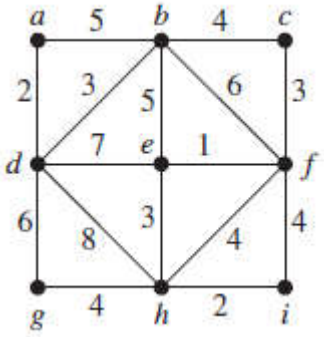
Problem#9 [2.5x2 points]

In following Exercises use **Prim's algorithm** to find a minimum spanning tree for the given weighted graph. Also use **Kruskal's algorithm**to find a minimum spanning tree for the weighted graph.

1.



2.



Problem#10 [2x5 points]

1. How many different permutations are there of the set{*a, b, c, d, e, f, g*}? How many of them ends with a?

2. In how many different orders can five runners finish arace if no ties are allowed?

3. How many possibilities are there for the win, place, andshow (first, second, and third) positions in a horse racewith 12 horses if all orders of finish are possible?

4. There are six different candidates for governor of a state.In how many different orders can the names of the candidates be printed on a ballot?

5. How many ways are there for eight men and five womento stand in a line so that no two women stand next to eachother? [*Hint:* First position the men and then considerpossible positions for the women.]