University of Dhaka
Department of Computer Science and Engineering
2nd Year 2nd Semester B. Sc. In-course Examination 2021
CSE 2201: Database Management Systems - I

Total Marks: 25 Time: 1.5 Hours

1. You have to design a relational database for Dhaka University Accommodation System. The domain of the database is not limited to the information given below but you can assume other more parameters to make it your own.

Dhaka university owns many buildings to provide housing facility to its employees; teaches, officers, 3rd and 4th class employees. Employees are defined by their ID, name, department/office, designation, basic salary, date of joining, date of retirement etc. Buildings are characterized by their names (Bangabandhu Tower, South fuller road, North fuller road, Tower Building, Shaheed Munir Chowdhury Bhaban, Shaheed Abul Khair Bhaban, Sheikh Rassel Tower etc.), locations (Anandabazar, Fuller Road, Nilkeet, Shaheed Miner Area etc.), no. of floors, no of flats etc. Flats of these buildings are again characterized by flat no, square feet, no of rooms, no. of washrooms etc. Teaches, offices and other employees work in different departments and offices of the university. They are allocated flats in different buildings according to point system which mainly dependents on basic salary and service length. So the employees, who are interested to live in the campus area, have to apply for accommodation to the university and based on their points, they are allotted accommodations. Residents of these buildings have no, one or more children. There are some schools around university area and most of the university employees' children used to study in these schools.

i) You have to consider simple, composite, derived and descriptive attributes.
ii) One or more entity sets should be treated as weak (example children).

Now, do the following:

a) Create E-R diagram for your design with clearly mentioning 8
i) Primary key and partial key/discriminator of each entity or relationship set
ii) Mapping cardinality and participation constraints

b) Convert the designed E-R model to Relational model and draw the Schema diagram for the relational model. 5

c) Write **SQL** and Relational Algebra(**RA**) statemets for the following queries of your own database. 12
i) Find names, designation, department/office and date of allocation of the employees of 'Chemistry' department.
ii) For each building find the no. of empty flats.
iii) Find the teachers who live in the university campus and having 'B+' blood group.
iv) Update database for the teachers who have shifted from 'Shaheed Abul Khair Bhaban' to 'Tower Building'.
v) Modify database for the employees who have gone retirement on 30 June, 2020.
vi) Find the names and department/office of the employees who do not live in the campus but their children study in 'Udayan' school.

2nd Year 2nd Semester Incourse Examination 2021
Department of Computer Science and Engineering
University of Dhaka
CSE 2203: Data and Telecommunications

Total Marks: 40 **Time: 1 Hour 20 Minutes**

1. a) Consider a channel with a 1-MHz capacity and an SNR of 63. 4

   i. What is the upper limit to the data rate that the channel can carry?

   ii. The result of part (i) is the upper limit. However, as a practical matter, better error performance will be achieved at a lower data rate. Assume we choose a data rate of 2/3 the maximum theoretical limit. How many signal levels are needed to achieve this data rate?

   b) A signal travels from point A to point B. At point A, the signal power is 100 W. At point B, the power is 90 W. What is the attenuation in decibels? 2

   c) A nonperiodic composite signal contains frequencies from 10 to 30 KHz. The peak amplitude is 10 V for the lowest and the highest signals and is 30 V for the 20-KHz signal. Assuming that the amplitudes change gradually from the minimum to the maximum, draw the frequency spectrum. 2

   d) We need to upgrade a channel to a higher bandwidth. Answer the following questions: 4

      i) How is the rate improved if we double the bandwidth?
      ii) How is the rate improved if we double the SNR?

2. a) Draw the graph of following bit stream using NRZ-I, Manchester and AMI encoding scheme. 4

   i. 00000000 ii. 11111111 iii. 01010101 iv. 00110011

   b) Compare and contrast among NRZ-I, Manchester encoding and AMI. The following factors need to be considered – i) ratio r, ii) dc voltage, iii) baseline wandering and iv) Self synchronization 4

   c) We know that Manchester coding require more bandwidth compare to AMI but Manchester encoding is free from baseline wandering. We want an encoding scheme where bandwidth is same as AMI and which is with educe band width with baseline wandering problem fee encoding scheme. How can we achieve it using AMI? 3

   d) Deduce the relation $B_{min} = n_b \times B_{analog}$ where B_{min} is the minimum bandwidth of digital signal, n_b is the number of bits per sample and B_{analog} is the bandwidth of analog signal. Assume that analog signal is converted into digital signal using pulse code modulation 4

   e) We have sampled a low-pass signal with a bandwidth of 300 KHz using 512levels of quantization. 3

   i. Calculate the bit rate of the digitized signal.

   ii. Calculate the SNR_{dB} for this signal.

   iii. Calculate the PCM bandwidth of this signal

3. a) What is the number of bits per baud for the following techniques? 4

      i. ASK with four different amplitudes
      ii. FSK with eight different frequencies
      iii. PSK with four different phases
      iv. QAM with a constellation of 128 points

   b) Draw the constellation diagram of the following. 4

      i. ASK with peak amplitude 1 and 3
      ii. BPSK with peak amplitude value 2.
      iii. QPSK with peak amplitude 3
      iv. 8-QAM with two different amplitude value 1 and 3, and four different phases.

   c) Distinguish between FM modulation and PM modulation. 2

University of Dhaka
Department of Computer Science and Engineering
2nd Year 2nd Semester Mid Term Examination, 2021
CSE-2204: Computer Architecture and Organization

Total Time: 1 Hour 30 minutes **Total Mark: 30**

Answer any Five (5) questions

1. Discuss the advantage of carry look ahead adder over the parallel adder. Discuss the basic idea to achieve this advantage. Write down the carry bits generated by this adder for n = 4. 1+3+2=6

2. Find X × Y using the Booth's Algorithm where X = 3 and Y =5. Show each steps with necessary descriptions. 6

   01010

3. Discuss the advantage of non-restoring division over restoring division. Explain how this advantage is achieved. Show the memory configuration after storing $(1AF237BD)_{16}$ using Big Endian Storage Method. 1+2.5+2.5=6

4. Suppose W =10101, X = 11011, and Y = 010100. Discuss the concept of carry save addition using W, X, and Y. Discuss the pros and cons of different techniques to expand an ALU. 3+3=6

5. Consider the following C code: 3+3=6

```
int i=0, sum =0;
while(i<5)
{
  sum = sum+a[i];
  i++;
}
```

Write the MIPS instruction corresponding to this code.

Find the decimal code for the following instruction (Maintain the instruction format)

(i) lw $t0, 300($t1) [Opcode for lw = 35]

(ii) bne $s0, $s1, Exit [Opcode for bne = 5, Exit = 300]

6. Discuss the concept of pipelined processing using a four stage floating point processor. Find the latency and speed up factor for addition of eight pairs of floating point numbers. 2+4=6

CT-2_2021 CSE 2205 Marks : 15 Time : 60 m

1.	Mention the key differences between Active and Passive Transducers.	4
2.	Define IR Sensor with an Application.	2
3.	Describe the working principle of a Hydraulic Actuator.	4.5
4.	Mention the components of a vehicle electrical system.	2
5.	Define thermal conductivity. How can we measure it?	2.5

University of Dhaka

Department of Computer Science and Engineering

Second Year Second Semester Incourse Examination -2021

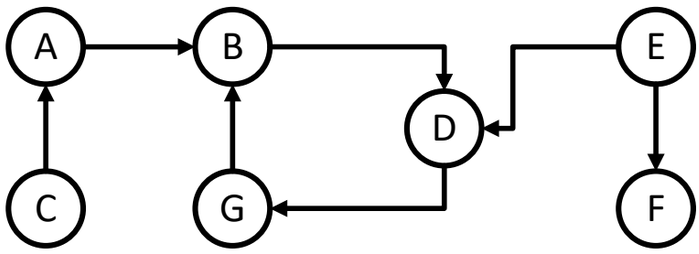
CSE-2202: Design and Analysis of Algorithms – I

Time: 1.20 Hours Total Marks: 24 +"1"

Name: **Class Roll:**

[Answer all the following questions]

1. [4+2]



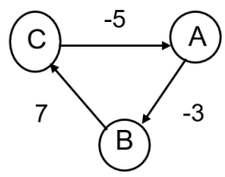
a. Consider the above directed graph G, having 7 vertices and 7 edges. Generate a component graph from this. You need to show all the steps (executing DFS(s), vertex ordering, etc.) in detail. "The component graph will always be a DAG" – do you agree with the statement?

b. ''The graph G can be declared as a Weakly Connected Graph as well as a Strongly Connected Graph'' do you agree with the statement, defend you answer with appropriate reasoning and figure?

2. a. Given a graph G with source s and weight function $w: E \rightarrow R$. Here, we use the terms $G.V$ and $G.E$ to represents the set of vertices and edges of G, respectively. Now, extend the following pseudocode to create an algorithm that can determine whether a negative cycle is there or not. During the process, you must also ensure that the increased computation cost does not exceed linear level, even in the worst-case scenario. [3+3]

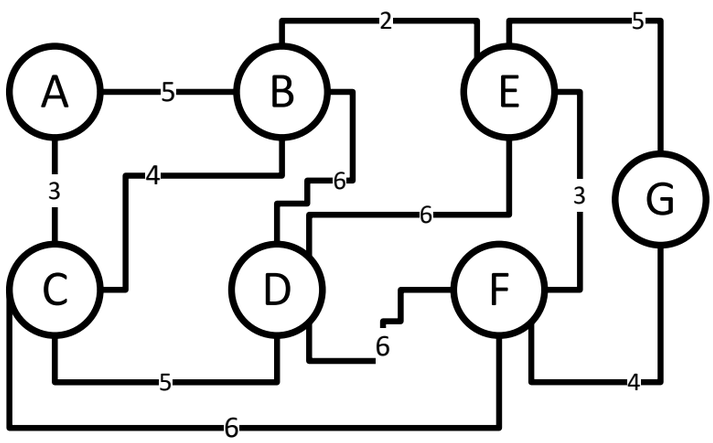
```
1  INITIALIZE-SINGLE-SOURCE(G, s)
2  for i = 1 to |G.V| − 1
3      for each edge (u, v) ∈ G.E
4          RELAX(u, v, w)
```

b. Execute the algorithm that you have written for Question 2(a) on the following graph, you need to show all the steps considering the following edge sequence: (C, A), (B, C) and (A,B).



3. a. It is easy to make each of Kruskal's and Prim's algorithms run in time *O(E log V).* Now, how can we run one of the above algorithms in time *O(E + V log V).* Mention that algorithm's name and how we can achieve this. Also mention the type of the graph for which this extension is suitable. [2+4]

b.

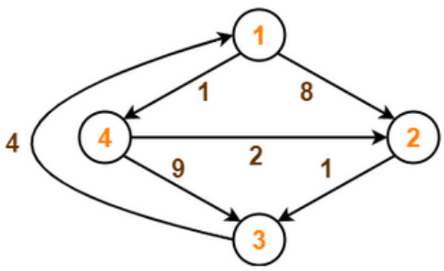


Consider the above undirected graph, which of the following is/are not the sequence of edges added to the minimum spanning tree using Kruskal's algorithm? Provide justification for your selection(s) and rejection(s). Finally, use any of the valid sequence to produce a minimum spanning tree.

(i) (B,E), (E,F), (A,C), (B,C), (F,G), (C,D)
(ii) (B,E), (E,F), (A,C), (F,G), (B,C), (C,D)
(iii) (B,E), (A,C), (E,F), (B,C), (F,G), (C,D)
(iv) (B,E), (E,F), (B,C), (A,C), (F,G), (C,D)

4. a. "A shortest path from a given source-destination pair cannot contain positive-weight cycle". Is it a correct statement? if yes, defend your answer with a suitable example. If not, then rephrase the statement to make it a correct one. [2+4]

b.



$D_1 =$

	1	2	3	4
1	0	8	∞	1
2	∞	0	1	∞
3	4	12	0	5
4	∞	2	9	0

$D_2 =$

	1	2	3	4
1	0	8	9	1
2	∞	0	1	∞
3	4	12	0	5
4	∞	2	3	0

Using Floyd Warshall Algorithm, find the shortest path distance between every pair of vertices. Initial two steps have been provided for your convenience. Finally, write the pseudo code (only nested loop along with the recurrence relation) for the remaining portions.