University of Dhaka

Department of Computer Science and Engineering

2^{nd} Year 2^{nd} Semester Incourse Examination, 2018

CSE-2201: Database Management Systems - I

Total Marks: 100 Time: 1 Hour 20 Minutes

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1. In spite of having a Lankan ancestry, Pererra has always represented himself as a Bangladeshi citizen. Suddenly, he has visited Srilanka as a technocrat and become fascinated to see the natural beauties of the country. After returning to Bangladesh, he has planned to have his own database of the natural beauties of the world. At this point, he is interested to spend as much money as needed to make a tree database of the world. Don't you wish to get the money?

   Each tree of the world is uniquely identified by its scientific name consisting of genus and species. Moreover, the database should store the local name, origin, discoverer, maximum height, types (deciduous or evergreen) of the tree etc. Some trees are hybrid of two different trees. Some regions of the world are identified as hotspot for some trees. This regions are stored with unique region name, geographical area, climate description etc. In addition, you have to store the geographically important trees of the regions.

   Now answer the following questions related to the database.

   (a) Draw an Entity Relationship Diagram (ERD) for the given scenario. All of your assumptions have to be identified clearly. [15]

   (b) Find all the candidate keys for each Entity in your diagram. [10]

   (c) List all the integrity constraints you need to add to implement the database in SQL. [5]

2. Consider the employee database given below where the primary keys are underlined.

   company(companyName, city)
   employee(employeeName, street, city)
   salariedWorker(employeeName, companyName, salary)
   hourlyWorker(employeeName, hourlyWage)

   Now, write down the **SQL query** and **relational algebraic expression** for any **5 (Five)** of the following questions. [5 × (4 + 3) = 35]

   (a) Find all the employee names with monthly salary who work in a company.

   (b) Find the list of hourly workers who live in 'Dhaka' city.

   (c) Find the company names with at least 3 employees where the salary is not less than 100000.

   (d) Find the company where some employees can be replaced by some hourly employees to get economical benefit. Consider that a regular employee has to work for 40 hours per week and there is 4 weeks in a month.

   List the employees with their categories

   (e) Employees are identified by three major categories: Regular, who gets *average* ± 5000 salary, High Salaried, who gets > *average* + 5000 salary and Low Salaried, who gets < *average* − 5000 salary. Here, *average* is the average salary of all the salaried workers.

   (f) Find all the employees who either work in a company for no more than 25000 salary or work in hourly basis for hourly wage not less than 500.

3. Answer any **7 (Seven)** of the following questions. [7 × 5 = 35]

(a) Why the use of lob (Large Object) is discouraged in database?

(b) List some fundamental differences between Schema Diagram and Entity Relationship Diagram.

(c) Describe the types of attributes in Entity Relationship Diagram.

(d) Give an alternative to the SQL set operations.

(e) Write an equivalent algebraic expression for $\pi_{id} student \cap \pi_{id} takes$.

(f) Point out and correct the following sql query, if there is any error.

```
Select *
From Student
Where id = ( Select id From takes)
```

(g) Point out and correct the following sql query, if there is any error.

```
Select dept_name
From Department
Where dept_name in (
Select dept_name From Instructor Where salary>10000
Group by dept_name Order by sum(salary)
)
```

(h) Write an equivalent algebraic expression for the following sql query.

```
Select id, course_id, avg(tot_cred) as average_tot_cred
From student natural join takes
Where id is not null
Group by id, course_id
Having count(sec_id) = 2
```

(i) Write an equivalent sql query for the given algebraic expression.

$$_{id,semester,year}\mathcal{G}_{count\,sec\_id}\left(instructor \bowtie teaches\right) \bowtie department$$

(j) List the limitations of basic pattern matching in sql. Give a solution to find all the string with odd number of a.

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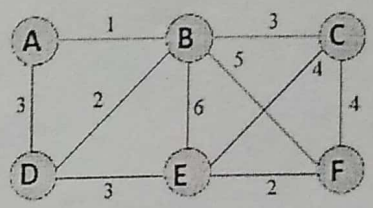
Department of Computer Science and Engineering

2nd Year 2nd Semester In-course Exam, 2018

Course Code: CSE 2202, Course Title: Design and Analysis of Algorithms – I

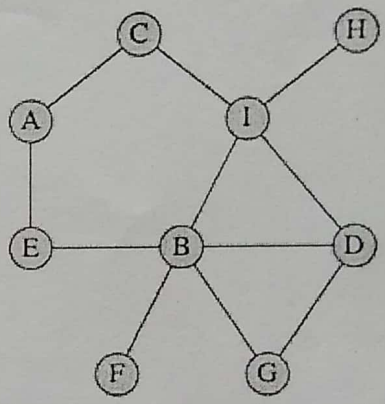
Time: 1 hour 30 Minutes

1. a) Execute Bellman Ford Algorithm on the following graph starting from node A. Instead of V-1 iterations, run the first three iterations only. You should follow the given edge ordering: BC, AB, EF, CF, BD, CE, AD, BE, BF, DE. Show each steps. 10



b) Propose an edge ordering for the graph given in 1(a), such that you will need minimum number of iterations to find the shortest path for all nodes. How many iterations will you need for your given edge ordering? 10

2. a) Run DFS on the following graph and find the starting time, finishing time for each node. You should traverse the graph in **lexicographic** order. You should draw the graph in your script and mark each node with starting time/ finishing time/ low value. 10



b) Find low values for each node for the graph given in 2(a). Find articulation points and bridges based on the low values of those nodes. 10

3. Prove that, all the bridges of a graph must be a part of the minimum spanning tree. 10

4. Give a linear-time algorithm that takes as input a directed acyclic graph **G** and two vertices **S** and **T**, and returns the number of simple paths from **S** to **T** in **G**. Your algorithm needs only to count the simple paths, not list them. 10

5. The diameter of a tree is defined as the largest of all shortest-path distances in the tree. Give an efficient algorithm to compute the diameter of a tree, and analyze the running time of your algorithm. 10

6. Device an all pair 2nd best shortest path algorithm based on Floyd Warshal algorithm. You should assume that the given graph is simple, directed and weighted graph with positive edge weights. There won't be any self-loops in the graph. 10

Department of Computer Science & Engineering
University of Dhaka
Mid-Term Examination 2018
CSE 2203:Data and Telecommunications

Time: 75 minutes

Full Marks: 25

1 How can we tell whether a composite signal is periodic or non-periodic just by looking at its frequency domain plot? 1

2 What is *baseband* transmission? Give an example of baseband transmission system. 2

3 A composite signal is given by the following function $f(t) = (1 + 0.1\cos 5t)\sin 100t$ Find the amplitude, phase, and frequency of that signal and represent it in frequency domain. $\sin x \cos y = (\sin(x+y)+\sin(x-y))/2$ 5

4 Distinguish between *distortion* and *noise*. 2

5 Assume we need to send a sequence of computer screen images over a copper link. The screen is 2560x1600 pixels, each pixel being 24 bits. There are 60 screen images per second. If the bandwidth of the link is 256kbps, what is minimum number of signal levels required to accomplish this task? 3

6 Suppose there is a 10 Mbps microwave link between a geostationary satellite and its base station on Earth. Every minute the satellite takes a digital photo and sends it to the base station. Assume a propagation speed of 2.4×10^8 meters/sec. 60000km 3

a. What is the propagation delay of the link?
b. What is the bandwidth-delay product, $R \cdot d$prop?
c. Let x denote the size of the photo. What is the minimum value of x for the microwave link to be continuously transmitting?

7 A signal with 200 milliwatts power passes through 10 devices, each with an average noise of 2 microwatts. What is the SNR? What is the SNRdB? 3

8 We have a channel with 4 KHz bandwidth. If we want to send data at 100 Kbps, what is the minimum SNRdB? What is the SNR? 2

9 A signal generator is producing a square wave with a period of 1ms. What happens (show illustrations with possible reasons) when it is passed through: 4

i) a lowpass filter with a cutoff frequency of 3KHz
ii) a highpass filter with a cutoff frequency of 3KHz

(note the cutoff frequency of a filter is the frequency at which the signal is attenuated by 3dB)

University of Dhaka

Department of Computer Science and Engineering

Incourse Examination, Second year- 2018

CSE 2204: Computer Architecture and organization

Full Marks: 30 **Time: 1 Hour 30 Minutes**

Answer any three of the following questions.

1. (a) What are the basic functional units of a computer? Distinguish between CPU, Microprocessor and IOP. 3

   (b) Which factors affects on processor performance? Explain at least five of those parameters with examples. 4

   (c) Describe Iron law to estimate processor performance. Explain the impact of each parameter. 3

2. (a) Define Scalar computing, Vector Computing, Green Computing, Grid Computing and Cloud Computing with examples. 3

   (b) What do you understand by pipeline processing? Briefly explain the operation of a five-stage instruction pipeline processor. 4

   (c) What do understand by speed up of processing? Calculate speed up properties considering that you have a program of 230 instructions in which 70 instructions you can process in parallel. 3

3. (a) What is an instruction set of a processor? What are the basic types of instructions? Define each of them with examples. 3

   (b) What are the specifications of ALU and Branch type instruction considering a pipelined processor? 4

   (c) What is stage quantization regarding pipeline processor design? Explain using example. 3

4. (a) Briefly explain memory hierarchy considering cost, access time and capacity. 3

   (b) When cache evicting is required? Briefly explain evicting policy of cache memories. 4

   (c) Distinguish between write-through caches and write-back caches policies? Why those are follows? 3

Department of Computer Science and Engineering
University of Dhaka
2nd Year 2nd Semester 2017-2018
Course: CSE 2205
Incourse; Time: 1.5 Hour, Marks: 30, Date: 04.10.2018

Answer all questions

1. a) What do you mean by Mechatronics? Explain with an example. 2
   b) Explain five elements of a Mechatronics system and their functions. 5
   c) Apply mesh analysis to find v_0 in the circuit of Fig.1. 1.5

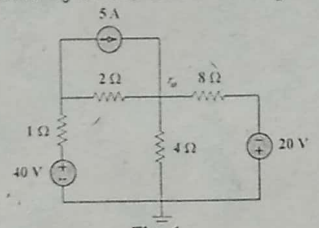


Fig.1

   d) Enlist the characteristics that make an Op Amp to ideal one. 1.5
   e) A 741 op amp has an open-loop voltage gain of 2×10^5, input resistance of 2 MΩ, and output resistance of 50Ω. The op amp is used in the circuit of Fig.2 below. Find the closed-loop gain v_o/v_s. Determine current i when v_s =3 V. 5.0

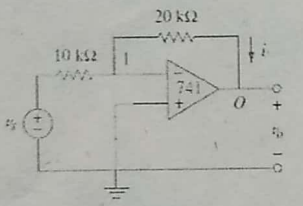


Fig.2

2. a) What do you mean by Mechanics? Explain with an example. 1.0
   b) Determine the magnitude and direction of force *F*1 shown in Fig.3. 4.0

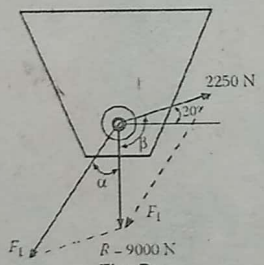


Fig.3

3. a) What is the necessity of a block diagram in a control system? Explain with a diagram. 2.0
   b) What do you mean by Transfer function? Explain with an appropriate equation. 4.0
   c) Consider the system shown in Fig.4. Simplify this diagram. 4.0

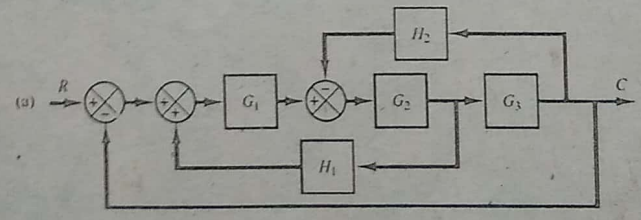


Fig.4

Or d) You are staying in Class Room No. 315 of CSE building in MukarramBhaban. You are having an air conditioner (ac) in your room. You want that the ac system should be maintained its running set temperature according to the real time need of the room temperature which may differ based on the number persons stay in the room. 4.0

Draw the schematic diagram of the control system to achieve the above condition and explain the function of its major components.