University of Dhaka
Department of Computer Science and Engineering
2nd Year 2nd Semester B. Sc. Incourse Examination 2020
CSE 2201: Database Management Systems - I

Total Marks: 35 Time: 1.5 Hours

1 Expected time: 55 Minutes

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 things to make it your own.

Dhaka university owns many buildings to provide housing facility to its employees; teaches, officers. These buildings are characterized by their names, locations, 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 and offices work in departments and offices of the university. They are allocated flats in different buildings according to point system which is mainly dependent 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 the point, they are allocated accommodation. Residents of these building 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 arrange simple, composite, derived and descriptive attributes.
ii) Children entity set should be treated as weak.
Now, do the following:

a) Create E-R diagram for your design with clearly mentioning 12
i) Primary key and partial key/discriminator
ii) Mapping cardinality and participation constraints with explanation

b) i) Draw the Schema diagram for your design. 9
ii) Find the non-trivial functional dependencies for each relation schema.
iii) Check that you have achieved the design goals of relational database.

2. Expected time: 23 Minutes

Consider the schema R = (A, B, C, D, E) with functional dependencies F = { A → B, BC → D}: 2+1 +3

i) Find the candidate key/s for R. +2
ii) Is CDE → AB in F^+ ?
iii) Decompose the schema into R_1 and R_2 so that the decomposed schemas are in BCNF and dependencies are also preserved. Give explanation.
iv) Is the decomposition in (iii) a lossless join decomposition? Explain.

3. Expected time: 12 Minutes

a) Use Armstrong's axioms to prove the soundness of Union, Decomposition and Pseudotransitivity rule. 3

b) Consider the following proposed rule for functional dependencies: If $\alpha \rightarrow \beta$ and $\delta \rightarrow \beta$, then $\alpha \rightarrow \delta$. Prove that this rule is not sound by showing a relation r that satisfies $\alpha \rightarrow \beta$ and $\delta \rightarrow \beta$, does not satisfy $\alpha \rightarrow \delta$. **Use at least 10 tuples**. 3

Incourse examination

CSE 2203- Data and Telecommunication

Full marks: 60 Duration: 60 minutes

1. Briefly describe –i) baseline wandering, ii) DC component , iii) Self Synchronization and their effect on digital transmission. 10

2. Consider a case of digital transmission where input is an analog signal. The bandwidth of the analog signal is 275 KHz and code size is 8. Calculate the following. 10

    a) Calculate the bit rate of the digitized signal
    b) Calculate the SNR_{dB} of this signal.
    c) Calculate the PCM bandwidth of this signal.

3. a) Describe the motivation of analog to analog conversion. 10
    b) Which analog to analog conversion technique is the most susceptible to noise? Justify your answer

4. Consider the case of a QPSK. Draw the wave form for the input 1 0 1 1 0 0 0 1 1 1. Show the following wave form. 10

    a) Input
    b) Carrier (two)
    c) Phase wise output (two)
    d) Resultant output

5. Consider a case of statistical TDM. There are 8 sources, each creating 300 (16 bit/character) characters per second. Each frame carries 4 slots at a time. The size of the address is 2 bit. Answer the following questions. 10

    a) What is the size of an output frame in bits?
    b) What is the output frame rate?
    c) What is the output data rate.

6. Consider a case of frequency hopping spread spectrum. The frequency table is as follows. 10

k-bit	Frequency
000	300
001	500
010	200
011	700
100	400
101	800
110	600
111	900

Draw FHSS cycles for following bit pattern.

i) 101 000 010 111 001 011 110 100
ii) 111 001 010 101 000 011 100 110

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

Full Marks: 30 **Duration: 1 Hour 15 minutes**

Answer any 4 (Four) of the following questions

1. Generate machine code for the following MIPS instructions (maintain instruction format) : 2.5+2.5+2.5=7.5

   i) j 100 [Opcode=2]

   ii) add $t1, $t2, t3 [Opcode=0, funct =32]

   Let PC= 10010010 01010111 10101101 00111010. Generate the content of PC after the execution of each the above-mentioned instructions.

2. Consider a number format for representing the floating point number. The total number of bits is 14, where 1 it is used to represent the sign **S**, 6 bits are used to represent the exponent **E** and remaining 7 bits are used to represent the fractional part **M** of the number. The significand is of form **1. M** and 1 is a hidden bit. This number format uses excess **k**-bit code and **k** is the number of bits in **E**. Now determine the following: 2+1+1.5+3.5=7.5

   1. Bias needed to calculate the exponent.
   2. The number range of E.
   3. The most positive exponent and the most negative exponent.
   4. What is the normalized binary representation of the number -22.875_{10} using the above mentioned number system?

3. Show the steps needed to calculate $Z = X \times Y$ using Booth's multiplication algorithm, where $X = 0101_2$ and $Y=1110_2$. 7.5

4. Discuss the advantages of non-restoring division over the restoring division. How you can perform ALU expansion? Discuss the pros and cons of each method. 3+4.5=7.5

5. Explain how you can enable a n-bit parallel adder to perform subtraction operation. Explain how you can speed up the carry processing in a carry-lookahead adder. Derive the equations for carry signals of a 3-bit carry-lookahead adder. 2.5+2.5+2.5=7.5