Bangladesh Open University
School of Science and Technology
B. Sc in Computer Science and Engineering Program
172 Term (2nd Year 2nd Semester) Final Examination
Course Code & Title: CSE2238 Database Management Systems

Time: 3 hours **Total Marks (5×14): 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1. (a) To store data of your organization, why would you choose databases and DBMS over regular files and files systems? Explain. 5

   (b) Discuss some scenarios where using a DBMS may not be beneficial. 3

   (c) What are some of the services DBMSs provide? 3

   (d) What are instances and schemas of Database? Explain with example. 3

2. (a) Define union and set difference operations in relational algebra. Consider the given relations r and s. Using the relational algebra find out: (i) $r \cup s$ (ii) $r - s$. 2+1

A	B
α	1
α	2
β	1

r

A	B
α	2
β	3

s

   (b) Relational schema defines attributes of an entity or object. Each attributes have domains associated with their value. Define attributes and domains. 4

   (c) Explain the following: (i) composite attributes (ii) atomic attributes (iii) single-valued attributes (iv) multi-valued attributes. 4

   (d) Using an example, explain referential integrity constraint for a foreign key. 3

3. (a) You have the following relations - 4

   STUDENTS(national_id, student_id, name, dob, phone_no)
   COURSES(course_code, course_title, descriptions)
   COURSES_TAKEN(national_id, course_code, year_taken) [this relations is to keep track of which students has completed what courses and in what years]
   For each of those relations above, identify candidate keys, primary keys and foreign key (if exists) and justify your answer.

   (b) As a freelance database designer you got a project to design a database for a real estate company. After much discussions with the client, you understood the following – 8

   (i) The company has several large projects like Blah Lake City projects, Jheelpar Bangalows and so on. And each project contains plots of varying sizes like 2 katha, 3 katha and so on.
   (ii) A client can create a booking for a plot in any of those projects by filling out a paper form at this time.
   (iii) Each client has to make monthly payments against their booking.
   (iv) Client must have at least one nominee information provided to create the booking.
   (v) Each booking also has a sales agent associated who gets commissions for the sale.

   You did some brainstorming and came up with the best ER (Entity-Relationship) schema possible. Show that schema.

   (c) Explain aggregate functions with examples. 2

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172 Term (2nd Year 2nd Semester) Final Examination

Course Code & Title: ECO2221 Economics

Time: 3 hours **Total Marks: 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1. (a) Define economics. 3

   (b) What are the differences between microeconomics and macroeconomics? 5

   (c) Write advantages and disadvantages of planning economy. 6

2. (a) What are the law of demand and law of supply? 1+1

   (b) What are demand schedule and demand curve? Draw a demand curve from a hypothetical demand schedule. 2+2+8

3. (a) Describe briefly basic principles of economics. 10

   (b) What are the factors of production? 4

4. (a) What do you mean by market equilibrium? Explain with graph. 6

   (b) (i) From the following data, plot the supply and demand curves and determine the equilibrium price and quantity: 8

Table: Supply and demand for pizzas

Price ($ per pizza)	Quantity demanded (pizzas per semester)	Quantity supplier (pizzas per semester)
10	0	40
8	10	30
6	20	20
4	30	10
2	40	0
0	50	0

   (ii) What would happen if the demand for pizzas tripled at each price? Show graphically.

5. (a) What do you mean by indifference curve? What are the properties of indifference curve? 2+4

   (b) Briefly discuss the consumer's equilibrium under indifference curve analysis. 8

6. (a) Distinguish between gross domestic product (GDP) and gross national product (GNP). 6

   (b) What do you mean by national income? 2

   (c) Briefly discuss the problems of measuring national income in developing countries. 6

7. Write short notes on 14
   (i) sunk cost; (ii) opportunity cost; (iii) recurring cost; (iv) non-recurring cost; (v) cash cost; (vi) book cost; (vii) incremental cost.

4. (a) Explain the ACID properties of Database Transaction. 5

(b) What is cascading rollback and cascade less schedules? Explain the testing procedure for viewing Serializability with example. 3+3

(c) What is lock? Describe the types of locks used in concurrency control. 1+2

5. (a) Explain the concept of functional dependency and its types. If B is a composite key, then what are the conditions that A be fully functionally dependent on B? 2+2

(b) Mention the merits and demerits of normalization. 4

(c) How would you normalize the table below? Show the normalization process. 6

national_id	name	phones	exam_code	exam_long_nme	Result
111	John	0182222222, 01752258963	SSC	Secondary School Certificate	3.5
111	John	0182222222, 01752258963	HSC	Higher Secondary Certificate	3.7
222	Jane	0182222222, 01752258963	SSC	Secondary School Certificate	3.9
Jane 222	~~John~~ Jane	0182222222, 01752258963	HSC	Higher Secondary Certificate	4.0

6. (a) Explain DDL and DML with examples. 3

(b) What is the use of group by clause in SQL query statement? Explain with an example. 3

(c) Explain natural join in SQL query with an example. 3

(d) Consider the following database schema of a sample university: 5

classroom (<u>building</u>, <u>roomNumber</u>, capacity)
department (<u>deptName</u>, *building*, budget)
course (<u>courseId</u>, title, *deptName*, credits)
instructor (<u>tID</u>, name, *deptName*, salary)
section (*courseId*, <u>secId</u>, <u>semester</u>, <u>year</u>, building, roomNumber, timeSlotId)
teaches (*tID*, *courseId*, <u>secId</u>, semester, year)
student (<u>sID</u>, name, *deptName*, totCred)
takes (*sID*, *courseId*, secId, semester, year, grade)
advisor (*sID*, *tID*)
timeSlot (<u>timeSlotId</u>, day startTime, endTime)
prereq (*courseId*, *prereqId*)

Write the following queries in SQL:

(i) Find the names and average salaries of all departments whose average salary is greater than 50000.

(ii) Find the total number of (distinct) students who have taken course sections taught by the instructor with ID10101.

(iii) Find the name of all instructors with salary between $90,000 and $100,000.

(iv) Find courses offered in Fall 2009 but not in Spring 2010.

(v) Find names of instructors with salary greater than that of some instructors in the Biology department.

7. (a) Large globally distributed organizations may need to distribute their databases. What is your understanding of distributed databases and why do you think organizations may need to distribute their databases? 6

(b) There are two strategies in distributing a database - replication and fragmentation. Explain these two techniques along with their advantages and disadvantages. 8

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172 Term (2nd Year 2nd Semester) Final Examination

Course Code & Title: CSE2232 Microprocessors and Microcontrollers

Time: 3 hours **Total Marks (5×14): 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1.	(a)	What is microprocessor? How does the 8086 differ from the 8085 microprocessor?	1+2
	(b)	Draw the block diagram of 8086 microprocessor and explain start up operation of 8086 µp.	6
	(c)	Explain Memory Segmentation in 8086 Microprocessor. What is the purpose of this segmentation?	3+2
2.	(a)	What is accumulator? Explain its role in 8085 microprocessor?	1+4
	(b)	Consider, the contents of the following registers are: CS = 1111 H, DS = 3333 H, SS = 2526 H, IP = 1232 H, SP = 1100 H, DI = 0020 H. Calculate the corresponding physical addresses for the address bytes in CS, DS and SS.	6
	(c)	What are the advantages of using assembly language instead of writing a program directly in machine language?	3
3.	(a)	Explain the architecture of 80x87 coprocessor.	4
	(b)	Explain the control register of 80x87of arithmetic coprocessor.	5
	(c)	Explain the read and write cycle in 8086 µp.	5
4.	(a)	What are addressing modes in 8086? Discuss with the example.	5
	(b)	Write an assembly language program to multiply two 8 bit numbers.	1+2
	(c)	Explain the following instructions with examples: i) XCHG ii) PUSH AX iii) TEST	2+4
5.	(a)	Distinguished between memory mapped I/O and I/O mapped I/O.	4
	(b)	How 8086 responds to the interrupt request?	4
	(c)	Explain the initialization command words of 8259A.	6
6.	(a)	Distinguish between microprocessor and microcontroller.	3
	(b)	Briefly explain the block diagram of programmable Timer/counter 8254.	6
	(c)	Briefly explain the architecture of 8051 microcontroller.	5
7.	(a)	Write short notes on the followings technique: (i) RAM memory organization (ii) Handling Interrupt (iii)R-2R Network Approach	3×3
	(b)	Explain of interfacing ADC with 8255 of microcontroller.	5

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172 Term (2nd Year 2nd Semester) Final Examination
Course Code & Title: CSE22P5 Information System Analysis and Design Lab

Time: 3 hours **Total Marks: 60**

A. **Choose and perform one experiment by lottery from out of the following experiments.** **1×40=40**

Exp 1. Give a presentation of your project work.

Exp 2. Perform of BOU **Examinations System** mentioning the phases: Analyze Planning, Design, Documentation, Training and Support, Implementation.

Exp 3. Perform of BOU **Student Information System** mentioning the phases: Planning, Analysis, Design, Documentation, Training and Support, Implementation.

Exp 4. Perform of a **Hospital Management System** mentioning the phases: Analyze Planning, Design, Documentation, Training and Support, Implementation.

Exp 5. Perform of any **Car Parking Management System** mentioning the phases: Analyze Planning, Design, Documentation, Training and Support, Implementation.

Exp 6. Perform of a **Library Management System** mentioning the phases: Analyze Planning, Design, Documentation, Training and Support, Implementation.

Exp 7. Draw an Entity-Relationship diagram that describes the contents of the auction house database. You may assume that the auction house records name, phone number and address information for all customers. For each item, the auction house database contains a unique identifier (call it item#), a description, its owner, and the auction during which it was sold. For each auction, the database stores the date, the items put up for sale, who their buyer was, and their sale price.

Exp 8. Perform of **Online Shopping System** mentioning the phases: Planning, Analysis, Design, Documentation, Training and Support, Implementation.

Exp 9. Suppose you have to build an information system which stores and maintains information about all activities during a software development project. In particular, the system stores different versions of software components as they become available, external documentation in the form of reports, user and reference manuals (with different versions), stores project tasks, who was assigned to each task and when was the task completed. In addition, the system keeps track of meetings, test data, test runs, bug fixes etc.
For hardware, the project will use several workstations for project participants, as well as a central server where all the project information is kept. All machines are connected with an Ethernet LAN. Choose software architecture for the information system. Explain carefully your choice.

B. **Notebook on experiments.** **10**

C. **Viva-voce.** **10**

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B. Sc in Computer Science and Engineering Program

172 Term (2nd Year 2nd Semester) Final Examination

Course Code & Title: CSE2234 Information System Analysis and Design

Time: 3 hours **Total Marks: 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1.	(a)	What is information system analysis and design?	2
	(b)	Explain the different phases in SDLC. List some of the problems with the traditional waterfall SDLC.	5+2
	(c)	Describe Agile methodologies in information system analysis and design.	5
2.	(a)	What roll you personally play in the development and use of information systems? Who are information system users?	2+2
	(b)	What are the carrier prospects for systems analysts? If you want to pursue a career as a systems analyst, what knowledge and skills do you need to acquire?	1+2+2
	(c)	Write the different variants on System Analysts title. What is Problem-Solving Scenarios? Write general Problem-Solving approach.	2+1+2
3.	(a)	List and describe the common skills and activities of a project manager. Which skill do you think is most important and why?	5
	(b)	Explain the project management process and the importance of the different phases of project management process.	5
	(c)	Assign resources to a project and produce a project schedule with a Gantt chart.	4
4.	(a)	Differentiate between front- and back-office information systems. Describe the roll of information systems architecture in system development.	2+3
	(b)	Identify eight basic principles of system development. Define problems, opportunities and directives- the triggers for system development projects.	2+3
	(c)	What is value chain analysis and how organizations use this technique to evaluate and compare projects?	4
5.	(a)	Identify feasibility checkpoints in the systems life cycle. Define and describe four types of feasibility and their respective criteria.	2+3
	(b)	Describe the steps in the project initiation and planning process.	5
	(c)	Describe four traditional techniques for collecting information during analysis.	4
6.	(a)	What is DFD? Why do system analysts use DFD?	2+2
	(b)	Differentiate between include and extend relationship with proper example.	4
	(c)	Online ticket reservation application is to maintain flight details, flight status, reservation, cancellation process. The flight status which maintain flight ID, flight name, arrival time, departure time and also it contain details about the seats such business class seats, economic class seats. The flight detail contains the details about needed flight name as well as the details about the seats. Flight reservation which contains the flight ID, ticket number, passenger name, destination, flight name, business and economic class seats, travel charge, passport number, date of travel are reserved. Then the cancellation process is also carried out. Finally a report is generated about flight details, flight status, and reservation and cancellation tickets. Draw a Use case diagram for Online Flight Ticket Reservation System.	6
7.	(a)	Describe different types of testing process.	6
	(b)	Differentiate between Alpha and Beta testing.	4
	(c)	What are the common security threats to systems? How can they be addressed?	4

5. (a) What do you understand by activity selection problem? consider the following set of activities and find the largest subset of mutually compatible activities: 1+3

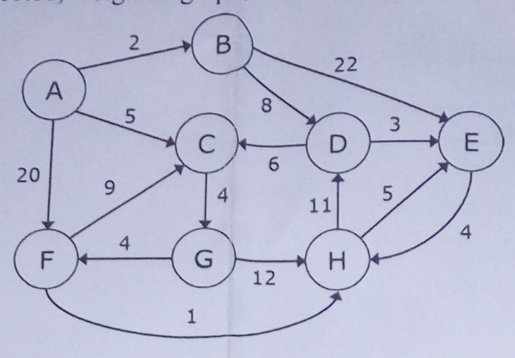
Activities	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	a_9	a_{10}	a_{11}
s_i(start)	1	3	0	5	3	5	6	8	8	2	12
f_i(finish)	4	5	6	7	9	9	10	11	12	14	16

(b) Solve the following Knapsack problem when n = 6, m = 20, 5
(p1, p2, p3, p4, p5, p6) = (25, 24, 15, 20, 22, 18) and (w1, w2, w3, w4, w5, w6)=(5, 6, 8, 7, 4, 9).

(c) What do you understand by Huffman code? Find Huffman code for the following: 1+4

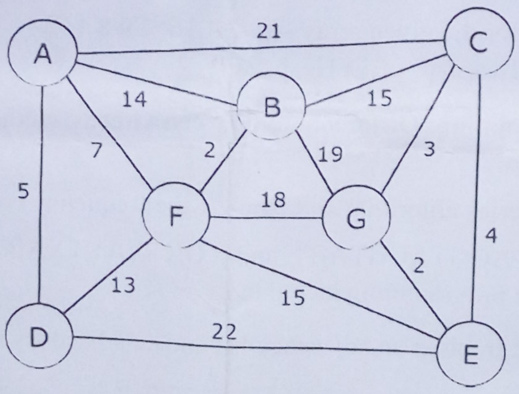
Character	**A**	**E**	**I**	**O**	**U**	**Space**	**T**	**New Line**
Frequency	15	10	21	5	7	12	3	7

6. (a) Consider the following directed, weighted graph: 6



Use Dijkstra's algorithm to calculate the single-source shortest paths from vertex A to every other vertex.

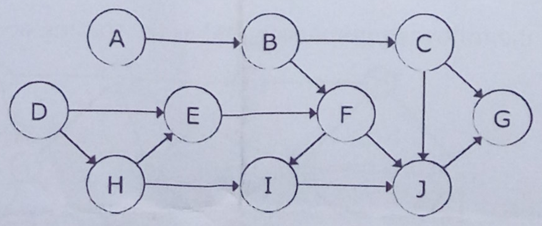
(b) Compute minimum spanning trees for the following undirected, weighted graph: 4+4



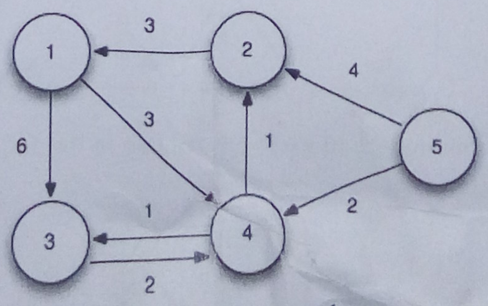
i) Use Prim's algorithm to calculate a minimum spanning tree starting from vertex A.
ii) Use Kruskal's algorithm to calculate a minimum spanning tree of the graph.

7. (a) Distinguish between single source shortest path and all pairs shortest path algorithms. 2

(b) Perform topological sorts on the following directed graph: 4



(b) Consider the following graph: 8



The numbers next to the edges denote the length of the edge. Determine the shortest paths between all pairs of nodes using Floyd -Warshall algorithm.

Bangladesh Open University

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B. Sc in Computer Science and Engineering Program

172 Term (2nd Year 2nd Semester) Final Examination

Course Code & Title: CSE2236 Computer Algorithms

Time: 3 Hours **Total Marks: 70**

[N.B.: Answer any 5 (five) questions. The figures in the right margin indicate the full marks. All portions of each question must be answered sequentially.]

1. (a) What is algorithm? What kinds of problems are solved by algorithms? 1+2

   (b) What do you understand by asymptotic notation? Define Ω notation, Θ notation and O notation with proper example. 1+6

   (c) Calculate the time complexity of the following algorithm: 4

```
Sort(a){
  for j = 2 to a.length{
        key = a[j];
        i = j - 1;
        while (i>0 and a[i]>key){
              a[i+1] = a[i];
              i = i - 1;
        }
        a[i+1] = key;
  }
}
```

2. (a) Define divide and conquer strategy. Give some examples for divide and conquer method. 1+1

   (b) Write the pseudo code for quick sort algorithm. Show the steps to sort the following array using quick sort algorithm: [4 10 9 3 5 7 8 6] 3+4

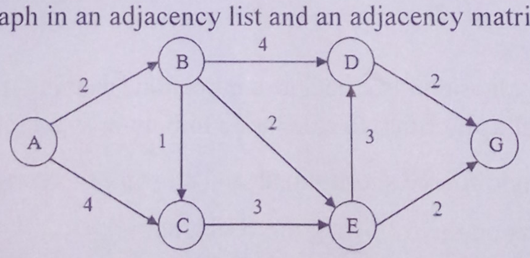
   (c) Do the following action for the given array – [3 2 4 16 7 9 8 14] 5
   (i) Build the heap (ii) Heapify (iii) Heapsort

3. (a) Define Dynamic Programming. Differentiate between Greedy method and Dynamic Programming technique. 1+2

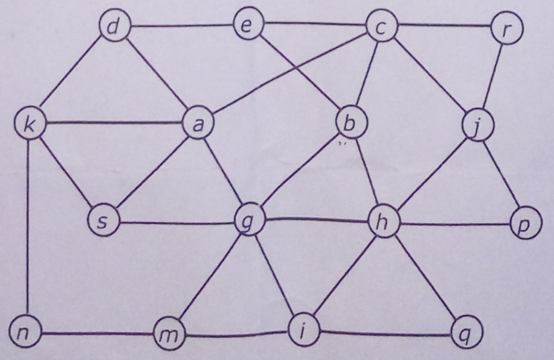
   (b) Write down Fibonacci series algorithm and tabulate the frequency count for complexity analysis. 3+2

   (c) Consider the strings "AGGTAGGTAB" and "GXTXAYTXAB". Find the longest common substring using dynamic programming technique. 6

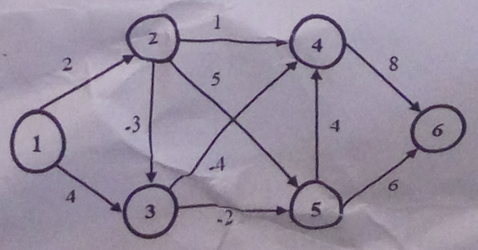
4. (a) Represent the following graph in an adjacency list and an adjacency matrix. 3



   (b) Find BFS and DFS for the following graph using 'a' as the starting node: 3+3



   (c) Find the shortest paths from node 1 to every other node in the following graph using the Bellman and Ford algorithm. 5



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Bangladesh Open University

School of Science and Technology

B. Sc in Computer Science and Engineering Program

172 Term (2nd Year 2nd Semester) Final Examination

Course Code & Title: CSE22P7 Computer Algorithms Lab

Time: 3 hours **Total Marks: 60**

A. Choose one experiment by lottery from out of the following experiments. **1×40=40**

Exp 1. Write a program to implement Insertion sort and Selection sort algorithm.

Exp 2. Write a program to implement Dijkstra's algorithm to find the shortest path of a graph.

Exp 3. Write a program to implement Breadth First Search (BFS) algorithm in a graph.

Exp 4. Write a program to implement Prim's/Kruskal's algorithm to find minimum cost spanning tree of a graph.

Exp 5. Write a program to implement Quick sort algorithm.

Exp 6. Write a program to implement Knapsack algorithm to find optimal solution from any weight and profit values.

Exp 7. Write a program to implement Largest Common Subsequence.

Exp 8. Write a program to implement Depth First Search Algorithm.

Exp 9. Write a program to implement Heap sort algorithm.

Exp 10. Write a program to implement activity selection problem.

B. Notebook on experiments. **10**

C. Viva-voce. **10**