SPECIALTY: **Computer Science and Networks**

EXAM PAPER: **Databases and System Architecture**

Section A: SYSTEM ARCHITECTURE/CLOUD COMPUTING

Part I:

1) What is the meaning of the term **instruction set**? **(1mk)**
2) Write the following in full? **(2mks)**
3) State the function of an accumulator? **(1mk)**
4) What do you understand by backward compatible of a CPU? **(1mk)**
5) Give the full meaning of ALU and state its function? **(2mks)**

What is the name given to the length of a register and what does it signify?

6) **(2mks)**
7) What does an Operation code indicate? **(1mk)**
8) State and explain the main steps in the instruction cycle of a processor? **(3mks)**
9) Differentiate between an input instruction and an output instruction of a processor? **(1mks)**
10) State the function of a program counter? **(1mks)**
11) What do you understand by an instruction decoder? **(1mks)**
12) Give the role of the following busses:
    a) Address bus
    b) Data bus
    c) Control bus

(3mks)

13) Why are cache memories important? **(1mk)**

For question 14 to 20, fill the blank with the appropriate answer from the list provided.

14) The method of synchronizing the processor with the I/O devices in which the device sends a signal when it is ready is?_____ **(1mk)**
15) The of accessing the I/O device by repeatedly checking the status flags is _____**(1mk)**
16) If a system is 64 bit machine, the length of each word will be_____? **(1mk)**
17) A 24 bits address generates an address space of _____ locations? **(1mk)**
18) During the execution of the instructions, a copy of the instruction is placed in the_____? **(1mk)**
19) A processor performing fetch or decoding of different instruction during the execution of another instruction is called_____? **(1mk)**
20) The technique used to store programs larger than the memory is_____? **(1mk)**

21) What do you understand by memory-mapped I/O? **(1mk)**

22) Differentiate between the Harvard and the Von Neumann's architecture in terms of memory arrangement? **(2mks)**

Part II: 20marks

Cloud computing and networking.

1. Define cloud computing? **(4mks)**

2. What is public cloud? (**4mks**)

3. What is private cloud? (**4mks**)

4. Ethernet standards enable 1Gbit/s over 4 pairs of twisted cabling, yet the physical media has a bandwidth much less than 1GHz, e.g., 250MHz is common.

i) Explain how such high data rates are achieved, and[**4 marks**]

ii) explain how physical media errors are reduced or eliminated. **[2 marks]**

iii) Explain, with the aid of diagrams, how Code-Division Multiple Access permits two or more pairs of nodes to communicate over a common medium (e.g., wireless) simultaneously. **[2 marks]**

Section B: **DATABASE SYSTEMS (50 marks)**

Question 1: 20 marks

I. Define a Relational database (2 marks)

II. Define a Relational Database Management system and state some examples of DBMS **(3 marks)**

III. Briefly explain the following terminologies **(5 marks)**

a) Database b) An entity c) Super key d) strong entity e) Table

IV. Match the following: **(10 marks)**

1. Data redundancy	a. Foreign keys for relationships
2. Inconsistent data	b. Data storage
3. Data independence	c. Large data volumes
4. Data integration	d. Used for storing data
5. Data repository	e. Structure definition
6. Data dictionary	f. Easy to administer
7. Decision support database	g. Wasted storage space
8. Relational data model	h. Unified view of corporate data
9. Centralized database	i. Data separated from program logic
10. Punch cards	j. Errors on customer documents

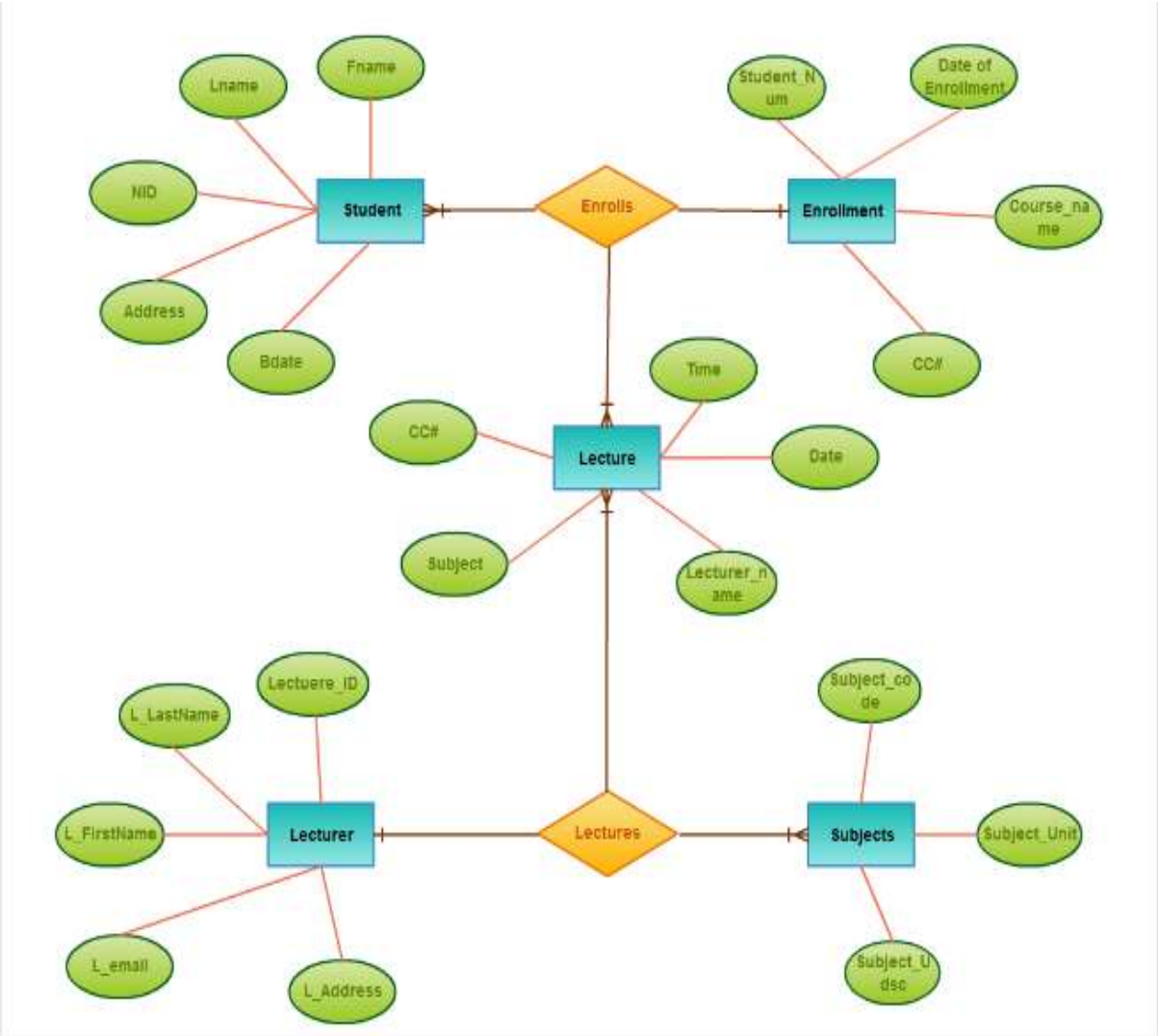
Question 2 10 marks

You are hired as a project leader for a new database project at a local bank. The bank wants to convert the existing file-based system to a database system. Your departmental head wants you to write a note to the executive vice president listing the expected benefits of the propose database system in comparison with the file-oriented system. Write a one page note.

Question 3: 20 marks

I. List the phases in the database design process **(2 marks)**

II. Consider the following ERD for a student enrollment system



a) Derive the relational schema for the above model. Consider the IDs and codes as primary attributes**. (10 marks)**

b) Write SQL queries to create all the tables in a typical DBMS **(10 marks)**