UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 3rd Semester Examination, 2023

GE2-P1-COMPUTER SCIENCE (34)

Time Allotted: 2 Hours   Full Marks: 60

The figures in the margin indicate full marks.

The question paper contains GE3A and GE3B.
The candidates are required to answer any *one* from *two* courses.
Candidates should mention it clearly on the Answer Book.

GE3A
OPERATING SYSTEMS

GROUP-A
Answer any *four* questions   3×4 = 12

1. What are the different types of operating systems?
2. What are the benefits of a multiprocessor system?
3. Discuss batch systems.
4. Differentiate between real time and time sharing system.
5. Discuss paging.
6. What is a semaphore? Give example.

GROUP-B
Answer any *four* questions   6×4 = 24

7. What is a process scheduler? State the characteristics of a good process scheduler.   2+4
8. Explain different conditions required for a deadlock to occur.
9. Discuss different limitations of semaphores.
10. Differentiate between non-preemptive and preemptive scheduling algorithm. Give examples.
11. Explain FCFS scheduling algorithm. Find the average turnaround time and average waiting time for the processes given in the table below:

Process	CPU burst time (in ms)
P1	24
P2	3
P3	3

12. Discuss one application that would benefit from the use of threads.

GROUP-C
Answer any *two* questions   12×2 = 24

13. Explain the following disk scheduling algorithms with the help of examples.
    (i) SSTF (ii) SCAN (iii) LOOK
    Comment on the selection of these scheduling methods.

14. Discuss different file allocation methods. Explain the linked allocation of the file implementation with merits and demerits.

15. Explain dynamic storage allocation problem? Explain different methods used to solve dynamic storage allocation problem.   4+8

16. Write short notes on any *three* of the following: 4×3 =12
   (a) Workstations
   (b) Virtual Memory
   (c) File operations
   (d) OS security and protection.

GE3B
DATABASE MANAGEMENT SYSTEMS

GROUP-A

1. Answer any *four* questions: 3×4 =12

   (a) Explain function dependency with a suitable example.
   (b) What is a schedule? Explain serializable schedule with an example.
   (c) Explain the role of a database administrator.
   (d) Define candidate, primary and surrogate keys.
   (e) What are schema and subschema? How are they different?
   (f) What are the ACID properties of a transaction?

GROUP-B

2. Answer any *four* questions: 6×4 = 24
   (a) Discuss any two data models along with their merits and demerits.
   (b) Draw an ER diagram of a library management system, clearly highlighting the entities, relationships, primary keys and foreign keys.
   (c) Explain the advantages of DBMS over file-oriented systems.
   (d) What do you mean by weak and strong entity sets? Discuss with example.
   (e) Explain 2-phase locking in DBMS.
   (f) Suppose that we decompose the schema
   $R = (X, Y, Z, U, V)$ into (X, Y, Z) and (X, U, V). Show that this decomposition is lossless given, $FD = \{X \rightarrow YZ, ZU \rightarrow V, Y \rightarrow U, V \rightarrow X\}$.

GROUP-C

3. Answer any *two* questions: 12×2 = 24

   (a) Discuss the 3-tier ANSI/SPARC database architecture along with its advantages. Provide an appropriate diagram of the same.
   (b) Explain the process of normalization taking an example. Discuss the steps needed to convert a relation in 1NF to 3NF.
   (c) Discuss different database constraints.
   (d) Explain different relational algebra operations.

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