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Daffodil International University

**Faculty of Science & Information Technology**

**Department of Information Technology & Management**

**Mid-Term Examination, Summer 2025**

**Course Code: ITM 217; Course Title: Data Structure and Algorithm**

**Sections & Teachers: FM (A)**

**Time: 1:30 Hrs** **Marks: 25**

Answer ALL Questions

*[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]*

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|---|---|---|---|---|
| 1. | | A software engineer is reviewing memory logs from an embedded system. She notices that the array element AUTO[1972] is stored at memory address 1128. From the documentation, she also learns that the array starts at index 1960, and each element occupies 4 words in memory. | | |
| | a) | **Define** static array and dynamic array. | [Marks- 2] | CLO-1 *Level-1* |
| | b) | Based on this information, **calculate** the starting memory address of the AUTO array. | [Marks- 3] | CLO-1 *Level-3* |
| | c) | **Analyze** how increasing the word size (e.g., from 4 to 8) impacts memory efficiency and data handling in an array-based system. | [Marks- 2] | CLO-1 *Level-4* |
| 2. | | The ITM Department's enrollment tracker handles student entries through a smart sequence where each record quietly points to the next. If a student drops out, the system seamlessly bridges the gap without reordering the rest. | | |
| | a) | **Identify** the best data structure for this enrollment tracker and **justify** your choice based on how it handles additions and removals. | [Marks-2] | CLO-2 *Level-5* |
| | b) | **Construct** an algorithm to traverse this enrollment tracker and print the registration IDs of all students whose registration ID is greater than 1000. | [Marks-4] | CLO-2 *Level-3* |
| 3. | a) | *A university helpdesk system uses a queue to manage student complaints. **Illustrate** how a queue operates in FIFO manner with a diagram.* | [Marks-2] | CLO-2 *Level-4* |
| | b) | **Compare** implementation of queue using array vs linked list in terms of flexibility and memory usage. | [Marks-3] | CLO-2 *Level-2* |

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|---|---|---|---|---|
| | c) | Why is circular queue preferred in some cases? **Justify** with an example. | [Marks-2] | CLO-2<br>*Level-5* |
| 4. | a) | **Explain** the difference between **best case**, **average case**, and **worst-case** time complexities.<br>Support your answer with an example from **binary search**. | [Marks-3] | *CLO-1*<br>*Level-2* |
| | b) | **Differentiate** between selection and iteration control structures in terms of behavior and use cases in algorithm design. | [Marks-2] | CLO-1<br>*Level-2* |