Code No: R21A0588 **Set No. 1**

COGNIZANT TECHNOLOGY SOLUTIONS
MULESOFT DEVELOPER, January 2026
RETAIL INTEGRATION ARCHITECTURE & MULESOFT
(LEVIS INTEGRATION)

Time: 3 Hours Max. Marks: 70

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 9 marks.

PART - A

(25 Marks)

1. **[2M]** Define **OMS** (Order Management System) and state its primary role in a modern retail ecosystem.
2. **[3M]** In an API-led architecture for a retailer, which layer would directly interact with the SAP ERP system? Justify your answer.
3. **[2M]** Explain the term **PGI** (Post Goods Issue) in the context of SAP flows.
4. **[3M]** Write a DataWeave expression to filter an array of Orders where the status is ”SHIPPED”.
5. **[2M]** Differentiate between a **WMS** (Warehouse Management System) and an Inventory Management system.
6. **[3M]** When integrating a high-volume ”Flash Sale” website with a legacy backend, would you choose Anypoint MQ or a direct HTTP call? Explain why.
7. **[2M]** What is the specific purpose of **SAP CAR** (Customer Activity Repository) in retail data aggregation?
8. **[3M]** Explain how a **Correlation ID** is used to track a lost retail order across distributed systems.
9. **[2M]** Define the **OTC** (Order to Cash) cycle.
10. **[3M]** Using DataWeave, how do you prevent a `NullPointerException` when mapping an optional field like `payload.shippingAddress`?

PART - B

(45 Marks)

UNIT - I

11. **[9M]** Explain the lifecycle of a Retail Order from placement on an E-commerce site to final delivery. Detail the roles of the **OMS**, **WMS**, and the Payment Gateway in this flow.

OR

12. **[9M] Scenario:** A customer buys an item online but wants to pick it up in-store (BOPIS).
    (a) Explain the orchestration logic required in the OMS.
    (b) How does the OMS communicate with the specific Store's inventory?

UNIT - II

13. **[9M]** Describe the **SAP OTC (Order to Cash)** process in detail. List the sequence of key SAP transactions (e.g., Sales Order, Delivery, PGI, Billing) and identifying where MuleSoft integration points typically exist.

OR

14. **[9M]** Compare and contrast **SAP OTC** and **SAP PTP (Procure to Pay)**. Explain why PTP is critical for Retail Supply Chain replenishment and how it interacts with Vendor systems.

UNIT - III

15. **[9M]** What is **SAP CAR** (Customer Activity Repository)? Explain its architecture and how it processes POS (Point of Sale) Data Transfer Logs (TLOGs) to provide real-time inventory visibility.

OR

16. **[9M] Scenario:** A retailer has 500 physical stores.
    (a) Explain the flow of data from a POS terminal scan to the SAP Backend.
    (b) What is the role of SAP PI/PO (Process Integration/Orchestration) versus a modern MuleSoft layer in this architecture?

UNIT - IV

17. **[9M]** Design an **Anypoint MQ** architecture for a retailer handling Black Friday traffic.
    (a) Explain the use of FIFO queues versus Standard queues for Order processing.
    (b) How would you handle "Poison Messages" (malformed orders) using a DLQ (Dead Letter Queue)?

OR

18. **[9M]** Compare **IBM MQ** and **Anypoint MQ**. In a scenario where a retailer needs to connect a cloud-based Salesforce Service Cloud to an on-premise Mainframe for loyalty points, which messaging system would you prefer and why?

UNIT - V

19. **[9M] DataWeave Scenario:** You receive an SAP IDoc (XML) containing a list of line items.

```
<items>
  <item id="101" type="SHIRT" stock="50"/>
  <item id="102" type="PANT" stock="0"/>
</items>
```

Write a DataWeave script to:

(a) Transform this into JSON.

(b) Rename `id` to `sku`.

(c) Filter out items with 0 stock.

(d) Add a field `status`: ”AVAILABLE”.

OR

20. [9M] Explain the `map`, `mapObject`, and `groupBy` operators in DataWeave. Provide a retail example where you group a list of sold items by their `category` (e.g., Electronics, Clothing).

Code No: R21A0588 **Set No. 2**

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PART - A

(25 Marks)

1. **[2M]** What is a **SKU** (Stock Keeping Unit) and why is it central to WMS operations?
2. **[3M]** Explain the concept of "Idempotency" in MuleSoft. Why is it crucial for processing Payment APIs?
3. **[2M]** List the standard SAP transaction code for creating a Sales Order.
4. **[3M]** Write a DataWeave expression using `flatten` to merge a nested array of inventory batches: `[[1,2], [3,4]]`.
5. **[2M]** Define **3PL** (Third-Party Logistics) in the context of retail fulfillment.
6. **[3M]** Explain the difference between a Queue and an Exchange in messaging systems like Anypoint MQ.
7. **[2M]** What is the **TLOG** (Transaction Log) in SAP Retail?
8. **[3M]** In API-led connectivity, why should the **Experience API** never call the System API directly?
9. **[2M]** What happens during the **Invoice Verification** step in SAP PTP?
10. **[3M]** How does the `distinctBy` operator in DataWeave help in processing duplicate customer records?

PART - B

(45 Marks)

UNIT - I

11. **[9M]** Discuss the functional architecture of a **WMS (Warehouse Management System)**. Explain the processes of Receiving, Put-away, Picking, Packing, and Shipping. How does MuleSoft trigger the "Shipping Label Generation"?

OR

12. **[9M] Scenario:** A fashion retailer implements "Endless Aisle" (ordering out-of-stock items in-store to be shipped to home).
    (a) Role of the OMS in viewing Global Inventory.

(b) How does the POS tablet interact with the OMS via APIs?

UNIT - II

13. [9M] Explain the **SAP PTP (Procure to Pay)** cycle.

(a) Detail the flow from Purchase Requisition $\rightarrow$ PO $\rightarrow$ Goods Receipt (MIGO) $\rightarrow$ Invoice (MIRO).

(b) How does MuleSoft automate the creation of a Purchase Order from an external planning system?

OR

14. [9M] Analyze the integration challenges in the **OTC (Order to Cash)** cycle. How do you handle a scenario where the SAP system is down during a Black Friday sale? Discuss the "Store and Forward" pattern.

UNIT - III

15. [9M] Compare **SAP ERP** (S/4HANA) and **SAP CAR**. Why can't a retailer just use the ERP for real-time inventory checking? Explain the concept of "Omnichannel Inventory Availability".

OR

16. [9M] Explain the flow of data involved in a **Return Merchandise Authorization (RMA)**. How does the system handle inventory updates when a customer returns a damaged item versus a resellable item?

UNIT - IV

17. [9M] Scenario: You are designing a "Smart Shelf" system where IoT sensors detect low stock.

(a) Design a 3-layer API architecture (Experience, Process, System) for this solution.

(b) Where would you use Anypoint MQ to decouple the sensor data from the backend ordering system?

OR

18. [9M] Explain **Transaction Tracking** in a distributed retail architecture.

(a) How do you implement end-to-end tracing using headers?

(b) How does logging in the "Process Layer" differ from logging in the "System Layer"?

UNIT - V

19. [9M] DataWeave Scenario: You have two arrays.

- `Orders: [{id: 1, cust: "A"}, {id: 2, cust: "B"}]`
- `Details: [{oid: 1, item: "X"}, {oid: 2, item: "Y"}]`

Write a DataWeave script to **join** these arrays based on ID, producing a single object per order containing the item details.

OR

20. [9M] Explain the `reduce` operator. Write a DataWeave script to calculate the **Total Order Value** from an array of line items: `[{price: 100}, {price: 200}, {price: 50}]`.