1)

Healing Hands Hospital, situated in the Central Province, is a leading healthcare provider offering premium medical, diagnostic, and inpatient services. Patients visit the hospital for consultations, treatments, and diagnostic tests. The hospital has various departments, such as General Medicine, Pediatrics, Orthopedics, and Cardiology, each equipped with advanced facilities and specialists. Currently, the hospital manages its operations manually but aims to implement an automated system to streamline processes. Hospital is planning to setup a computerized system and the simplified preliminary domain requirements summary is as follows:

At Healing Hands Hospital, patients are required to register by providing their NIC Number, name, address, telephone number, and insurance details (if applicable), after which they receive a unique patient ID. They can schedule appointments with specialists in various departments by specifying their preferred date, time, and doctor, while receptionists assist patients facing difficulties in booking. Once an appointment is scheduled, an Appointment Confirmation SMS is automatically sent to the patient.

For patients requiring hospitalization, admission details such as admission date, department, room type (General/Ward/Suite), and assigned doctor are recorded. This process includes assigning rooms and doctors to inpatients as part of the Admission Module. Diagnostic services, such as X-rays, blood tests, and MRIs, are offered, with bookings available online or through reception. Test results are uploaded digitally as part of the Upload Diagnostic Report feature included in the Diagnostic Services Module.

Payments for consultations, diagnostic tests, and hospital stays can be made via cash, credit or debit card. Discounts for specific payment methods (5% for credit cards, 2% for debit cards) are automatically applied as part of the Apply Payment Discounts.

The hospital pharmacy provides medicines prescribed through its Smart Prescription Module, where doctors create and send digital prescriptions directly to the pharmacy. If medicines are unavailable, the system includes a feature to Highlight Unavailable Medicines and extends to allow Print Prescriptions with the unavailable items marked for the patient to purchase externally. The pharmacy module also includes an Update Inventory Stock feature to ensure real-time stock management and extends to Generate Restock Alerts when stock levels are low. Reports on appointments, admissions, payments, diagnostic services, and pharmacy inventory are generated using the Report Module, which includes the generation of operational reports and extends to Generate Custom Reports tailored to the specific needs of the hospital administration.

Software Modules Identified:

1. **Master Module:** The administrator can insert, delete, update, view, and search patient details, appointment details, admission records, diagnostic service bookings, and generate various reports.
2. **Registration Module:** Patients register with the system by providing personal and insurance details, while receptionists can assist.
3. **Appointment Module:** Patients book appointments online, and receptionists assist with bookings. Appointment confirmations are sent via SMS through the Appointment Confirmation SMS feature included in the module.
4. **Admission Module:** Patients can be admitted as inpatients, with details on room preferences and assigned doctors recorded. This module includes the assignment of rooms and doctors as a key feature.
5. **Diagnostic Services Module:** Patients book tests online, with assistance from receptionists. Test reports are uploaded digitally as part of the module's Upload Diagnostic Report feature.
6. **Smart Prescription Module:** Doctors create digital prescriptions and send them directly to the pharmacy. The system includes the ability to Highlight Unavailable Medicines and extends to Print Prescriptions if certain medicines are unavailable.
7. **Payment Module:** Payment details, including type (cash/credit/debit), amount, and discounts, are recorded. The module includes Apply Payment Discounts and extends to Record Refunds for cancellations.

8. **Pharmacy Module:** The pharmacy manages inventory, processes medicine sales, and generates stock alerts for low inventory. It includes Update Inventory Stock and extends to Generate Restock Alerts.
9. **Report Module:** Reports on registrations, appointments, admissions, payments, diagnostic services, and pharmacy operations are generated for analysis and decision-making. The module includes Generate Operational Reports and extends to Generate Custom Reports based on specific needs. **(50 marks)**

(a) Identify the potential system Actors for the above system.

(05 marks)

ANSWER IN THIS BOX
• Patient
• Doctor
• Receptionist
• Administrator
• Pharmacy Staff

(b) Create a **use case narrative table** for the **"Booking an Appointment"** use case.

(15 marks)

1	Use Case Id:	01
2	Use Case Name:	Booking an Appointment
3	Actor(s):	Patient, Receptionist
4	Purpose:	To make an appointment with a doctor
5	Preconditions:	Patient must be registered in the system.
6	Post conditions:	An appointment is successfully done, and a confirmation SMS is sent to the patient.
7	Assumptions:	Doctors' availability is checked before confirming the appointment.
8	Main Flow:	1. Patient registers with the system 2. Patient provides details (date, time, preferred doctor). 3. System checks availability and books the appointment. 4. Confirmation SMS is sent.
9	Alternative Flow	1. If the preferred slot is unavailable, the system suggests alternative slots. 2. Patient selects a new slot.

(c) Identify and write down the relationships (Include, Extend, and Generalization) between the following use cases.

[10 Marks]

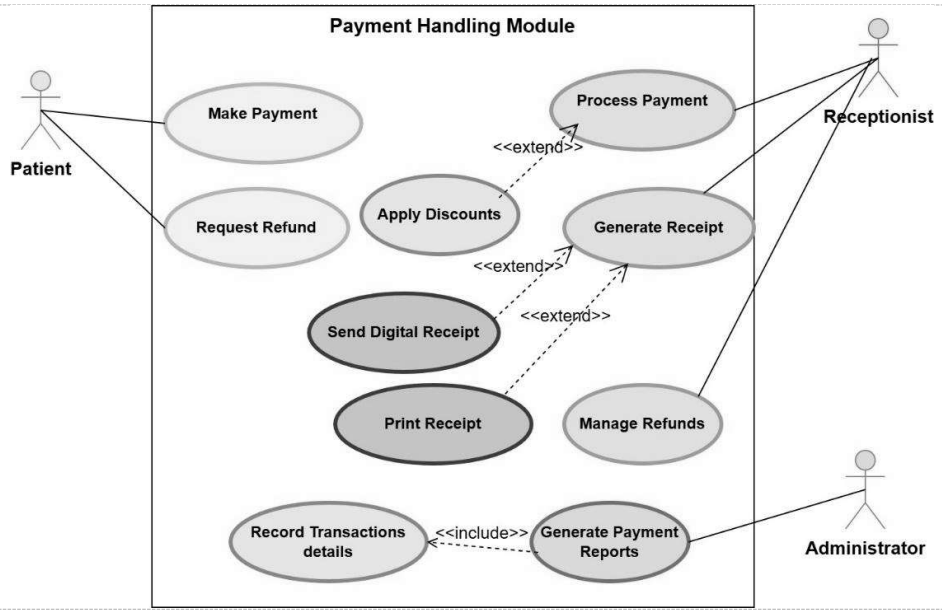
Use Case	Relationship
• **Create an Appointment** and **Send a Confirmation SMS**	Include
• **Create Prescription** and **Highlight Unavailable Medicines**	Extend
• **Process Payment** and **Apply Discounts**	Extend
• **Register Patient** and **Verify Insurance**	Extend
• **Process Payment** and **Generate Receipt**	Include

(d) Identify the Use Cases and draw the Use Case diagram related to the Payment Module details of which are given below.

"Patients can pay via **cash**, **credit cards**, or **debit cards**, with discounts offered for card payments (5% for credit, 2% for debit). The system generates digital receipts, sent via email or printed at the reception, and manages refunds for cancellations or unused services, ensuring refunds align with the original payment method. Additionally, the module logs all transactions and generates detailed payment reports for administrative purposes."

[05 Marks]

ANSWER IN THIS BOX



(e) According to the requirements described, **Patient**, **Doctor**, **Appointment and Payment** are four identified classes for the hospital management system. Identify and write down five (5) more potential **Entity Classes** for the system.

(05 marks)

ANSWER IN THIS BOX

- Room
- Credit Card
- Cash
- Diagnostic Test
- Debit Card
- Prescription

(f) Draw a class diagram segment containing classes **Patient**, **Doctor**, **Appointment** and **Payment**. Indicate multiplicities clearly in their relationships.

[10 Marks]

ANSWER IN THIS BOX