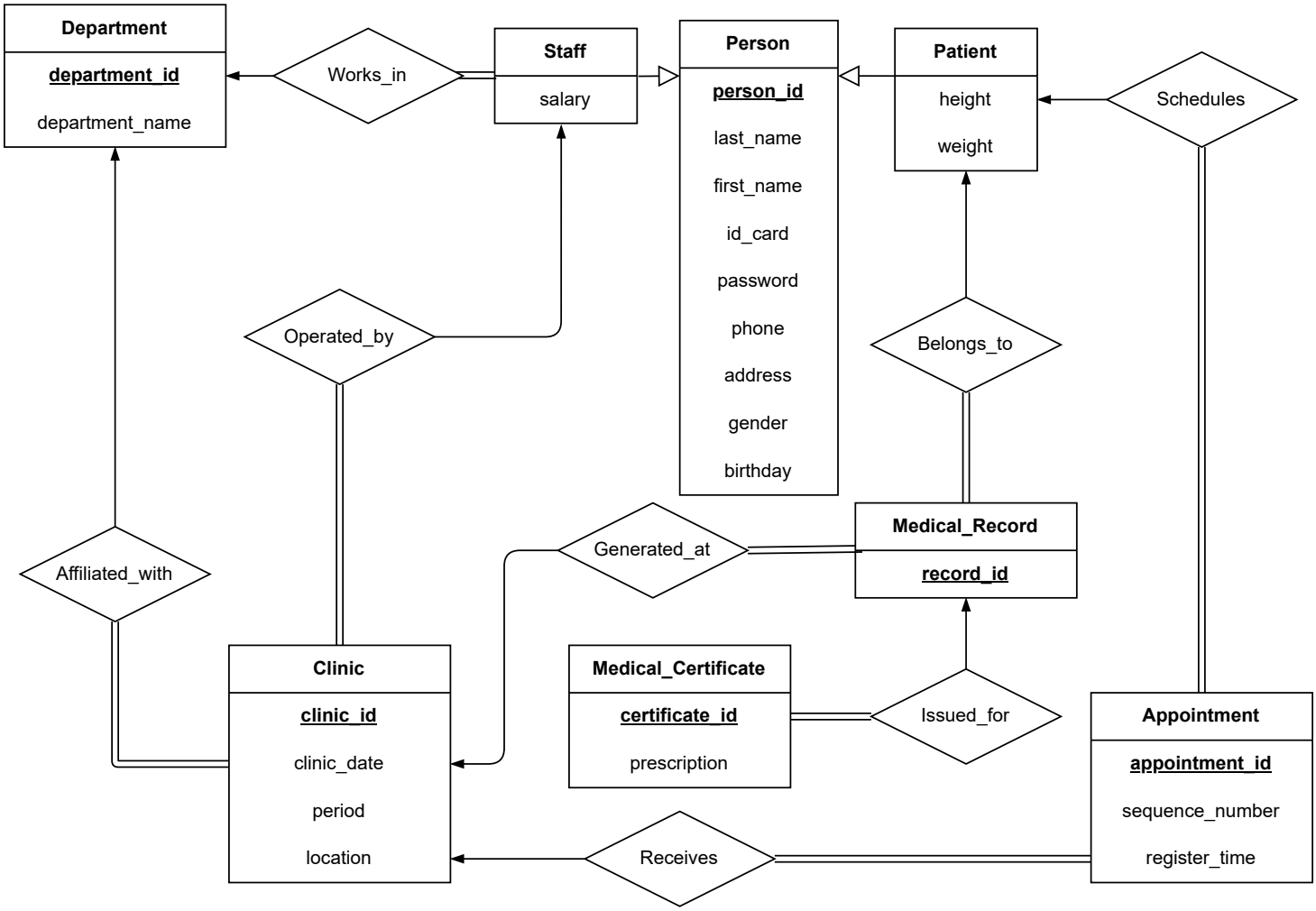
一、 系統功能介紹

此網站為醫院資訊管理系統，提供院內人員管理病患基本資料、門診、醫護人員、病歷及診斷書等功能，同時也開放民眾查詢門診時段及進行網路掛號服務。

二、 E-R Diagram



ps. 假設 staff 只有醫生

三、 系統中的表格定義與正規型式分析

1. Person table

```
CREATE TABLE `person` (
  `person_id` char(7) NOT NULL,
  `last_name` varchar(20) NOT NULL,
  `first_name` varchar(20) NOT NULL,
  `id_card` char(10) NOT NULL,
  `password` varchar(255) NOT NULL,
  `phone` varchar(20) NOT NULL,
  `address` varchar(100) DEFAULT NULL,
  `gender` enum('M','F') NOT NULL,
  `birthday` date NOT NULL,
  PRIMARY KEY (`person_id`)
)
```

F = {
  person_id → last_name, first_name
  person_id → id_card
  person_id → password
  person_id → phone
  person_id → address
  person_id → gender
  person_id → birthday
  id_card → last_name, first_name
  id_card → person_id
  id_card → password
  id_card → phone
  id_card → address
  id_card → gender
  id_card → birthday
}

因為 person_id 代表一個特定的人，可決定唯一的 last_name 、 first_name 、 id_card 、 password 、 phone 、 address 、 gender 、 birthday ，且 person_id 是一個candidate key

id_card 也能推到所有其他的任何屬性，且 id_card 是一個candidate key

→ 此表格符合3NF和BCNF。

2. patient table

```
CREATE TABLE `patient` (
  `person_id` char(7) NOT NULL,
  `height` decimal(5,2) DEFAULT NULL,
  `weight` decimal(5,2) DEFAULT NULL,
  PRIMARY KEY (`person_id`),
  CONSTRAINT `patient_ibfk_1` FOREIGN KEY (`person_id`) REFERENCES `person` (`person_id`
)
```

F = {
  person_id → height
  person_id → weight
}

因為 patient 是 person 的子實體集，因此其 PK 就是 person 的 PK person_id ，且 person_id 代表一個特定的人，可決定唯一的 height 、 weight ，且 person_id 是一個candidate key

→ 此表格符合3NF和BCNF。

3.staff table

```
CREATE TABLE `staff` (
  `person_id` char(7) NOT NULL,
  `department_id` char(7) NOT NULL,
  `salary` int(11) DEFAULT NULL,
  PRIMARY KEY (`person_id`),
  KEY `department_id` (`department_id`),
  CONSTRAINT `staff_ibfk_1` FOREIGN KEY (`person_id`) REFERENCES `person` (`person_id`),
  CONSTRAINT `staff_ibfk_2` FOREIGN KEY (`department_id`) REFERENCES `department` (`depa
)
```

F = {
  person_id → department_id
  person_id → salary
}

因為 staff 是 person 的子實體集，因此其 PK 就是 person 的 PK person_id ，且 person_id 代表一個特定的人，可決定唯一的 height 、 weight ，且 person_id 是一個candidate key

→ 此表格符合3NF和BCNF。

4. department table

```
CREATE TABLE `department` (
  `department_id` char(7) NOT NULL,
  `department_name` varchar(50) NOT NULL,
  PRIMARY KEY (`department_id`)
)
```

F = {
  department_id → department_name
  department_name → department_id
}

因為 department_id 代表一個特定的部門，可決定唯一的 department_name ，
又 department_name 也能代表一個特定的部門，可決定唯一的 department_id ，
且 department_id 、 department_name 都是candidate key

→ 此表格符合3NF和BCNF。

5. clinic table

```
CREATE TABLE `clinic` (
  `clinic_id` char(7) NOT NULL,
  `clinic_date` date NOT NULL,
  `period` enum('morning','afternoon','evening') NOT NULL,
  `department_id` char(7) NOT NULL,
  `location` varchar(100) DEFAULT NULL,
  `doctor_id` char(7) NOT NULL,
  PRIMARY KEY (`clinic_id`),
  KEY `department_id` (`department_id`),
  KEY `doctor_id` (`doctor_id`),
  CONSTRAINT `clinic_ibfk_1` FOREIGN KEY (`department_id`) REFERENCES `department` (`dep
  CONSTRAINT `clinic_ibfk_2` FOREIGN KEY (`doctor_id`) REFERENCES `staff` (`person_id`)
)
```

F = {
  clinic_id → clinic_date
  clinic_id → period
  clinic_id → department_id

clinic_id → location
clinic_id → doctor_id
}

因為 clinic_id 代表一個特定的門診，可決定唯一的 clinic_date 、 period 、 department_id 、 location 、 doctor_id ，且 clinic_id 是一個 candidate key

→ 此表格符合3NF和BCNF。

6. appointment table

```
CREATE TABLE `appointment` (
  `appointment_id` char(7) NOT NULL,
  `sequence_number` int(10) unsigned NOT NULL,
  `clinic_id` char(7) NOT NULL,
  `patient_id` char(7) NOT NULL,
  `register_time` datetime NOT NULL DEFAULT current_timestamp(),
  PRIMARY KEY (`appointment_id`),
  KEY `clinic_id` (`clinic_id`),
  KEY `patient_id` (`patient_id`),
  CONSTRAINT `appointment_ibfk_1` FOREIGN KEY (`clinic_id`) REFERENCES `clinic` (`clinic
  CONSTRAINT `appointment_ibfk_2` FOREIGN KEY (`patient_id`) REFERENCES `patient` (`pers
)
```

F = {
appointment_id → sequence_number
appointment_id → clinic_id
appointment_id → patient_id
appointment_id → register_time
}

因為 appointment_id 代表一個特定的掛號申請，可決定唯一的 sequence_number 、 clinic_id 、 patient_id 、 register_time ，且 appointment_id 是一個 candidate key

→ 此表格符合3NF和BCNF。

7. medical_record table

```
CREATE TABLE `medical_record` (
  `record_id` char(7) NOT NULL,
  `patient_id` char(7) NOT NULL,
  `clinic_id` char(7) NOT NULL,
  PRIMARY KEY (`record_id`),
  KEY `patient_id` (`patient_id`),
  KEY `clinic_id` (`clinic_id`),
  CONSTRAINT `medical_record_ibfk_1` FOREIGN KEY (`patient_id`) REFERENCES `patient` (`p
  CONSTRAINT `medical_record_ibfk_2` FOREIGN KEY (`clinic_id`) REFERENCES `clinic` (`cl
)
```

F = {
  record_id → patient_id
  record_id → clinic_id
}

因為 record_id 代表一個特定的掛號申請，可決定唯一的 patient_id 、 clinic_id ，
且 record_id 是一個candidate key

→ 此表格符合3NF和BCNF。

8. medical_certificate table

```
CREATE TABLE `medical_certificate` (
  `certificate_id` char(7) NOT NULL,
  `record_id` char(7) NOT NULL,
  `prescription` text DEFAULT NULL,
  PRIMARY KEY (`certificate_id`),
  KEY `record_id` (`record_id`),
  CONSTRAINT `medical_certificate_ibfk_1` FOREIGN KEY (`record_id`) REFERENCES `medical_
)
```

F = {
  certificate_id → record_id
  certificate_id → prescription
}

因為 certificate_id 代表一個特定的掛號申請，可決定唯一的 patient_id 、 clinic_id ，
且 certificate_id 是一個candidate key

→ 此表格符合3NF和BCNF。

四、 符合正規化和 ER 圖的表格定義

所有表格維持原定義