

Indian Institute of Technology, Madras
Chennai



CS6852 : Assignment 1 - Ontology Design

Group - 13

Domain - Hospital Management

Submitted To :

Prof. P Sreenivasa Kumar

Submitted By:

Akshay Charjan (CS22M008)

Bala Chandra Reddy (CS22M027)

Deepak Kumar Pamba (CS22M038)

Raj Mahajan (CS22M067)

P. Sai Sree Ram(CS22M076)

Class & Description

S. No	Class	Class Description
1	Person	Represents a human being
2	Male	It is a primitive concept referring to the real world gender male
3	Female	It is a primitive concept referring to the real world gender female
4	Staff	Concept denoting the employees of the hospital
5	Nurse	A female person of staff who assists doctor
6	Patient	A person who comes to hospital due to some disease
7	Doctor	A person who diagnose and treats the patients
8	Bill	Concept denoting the bill details of the patient
9	Item	Concept denoting the medicine item details of the patient
10	Security	Concept denoting the details of Security staff
11	Address	Concept denoting the address details of the person like street, city, state and zip
12	Diagnosis	Concept denoting the type of diagnosis of the patients
13	admission_date	It is a primitive concept which refers to the date at which a patient is admitted.
14	discharge_date	It is a primitive concept which refers to the date at which a patient is discharged.
15	Specialization	Concept which describes the subject in which doctors have done their work.
16	Patientstatus	These elements have two attributes admitted and discharged out of which one can be selected. Represents patients status.
17	Receptionist	A person on staff from the hospital who tracks the record of

		patients.
18	Schedule	Represents working hours of each staff member in the hospital.
19	Hospital	Represents hospitals which have one or more staff members.
20	Department	Concept which describes the place where each staff member works
21	Qualification	Concept which describes the degree done by each nurse
22	Total_amount	Concept which describes the price of all the items in the bill
23	Phone Number	Concept denoting the phone Number of each staff member
24	StartTime	Concept which describes the time at which doctor starts checkup in the morning
25	PrescriptionInformation	Concept which describes the items given to each patient
26	MedicalHistory	Concept which describes the details of previous records of the patients
27	TotalPatients	Concept which describes the maximum number of patients in each department
28	DepartmentHead	Concept which describes the head doctor of each department
29	ICU_Patients	Concept which describes the patients who are admitted in ICU
30	Infectious_Diseases	Concepts which describes the diseases which are infectious
31	Old_Patients	Concept which describes the patients who are elder in age
32	MultiSpecialistDoctor	Doctor having speciality in more than one domain.
33	MedicalDegree	Concept which describes a doctor having expertise in a specific area of medicine.
34	TreatmentType	Concept which describes the treatment plan for a patient

35	Maternity Patient	Concept which describes a female patient with pregnancy
36	ChronicPatient	Concept which describes a patient having a disease for long time
37	PatientRecord	Concept which describes the detailed report about patient disease
38	DepartmentHead	Concept which describes the person who leads the department.
39	PatientDischarged	Concept which describes the time at which patient will be discharged from the hospital
40	TreatmentType	Represents the plan followed by doctors to cure patients disease
41	EmergencyPatient	Concept which describes the Patient having some medical emergency.
42	PediatricPatient	Patient having age less than 13 years is child patient.
43	Cardiologist	The Person who is a specialist in cardiology.
44	Neurologist	The Person who is a specialist in neurology.
45	Specialization	Specialization includes various medical fields eg. Neurology.

Property & Description

Sl. No	Property Names	Property Description
1	hasName	<ul style="list-style-type: none"> (Person, Name) Person has a Name
2	hasQualification	<ul style="list-style-type: none"> (XXX,qualification) XXX has qualified M.B.B.S.
3	hasGender	<ul style="list-style-type: none"> (XXX,gender)

		XXX is male.
4	hasDesignation	<ul style="list-style-type: none"> (XXX,Head Nurse) XXX is Head Nurse.
5	hasDiagnosis	<ul style="list-style-type: none"> (XXX,diagnosis) XXX is diagnosed with cancer.
6	hasAge	<ul style="list-style-type: none"> (XXX,22) XXX is 22 years old.
7	hasItem	<ul style="list-style-type: none"> (XXX,I001) XXX has item I001.
8	hasDepartment	<ul style="list-style-type: none"> (XXX,Emergency room) XXX works in emergency room department.
9	hasItemUnitPrice	<ul style="list-style-type: none"> (I001,300) I001 item has unit price Rs.300.
10	hasAdmissionDate	<ul style="list-style-type: none"> (XXX,22-01-2022) XXX has admitted on 22-01-2022..
11	hasStreetAddress	<ul style="list-style-type: none"> (XXX, bakers street) XXX lives on bakers street.
12	hasCity	<ul style="list-style-type: none"> (XXX,Chennai) XXX lives in Chennai city.
13	hasState	<ul style="list-style-type: none"> (XXX,Tamil Nadu) XXX lives in Tamil Nadu state.
14	hasZIP	<ul style="list-style-type: none"> (XXX,123456) XXX zip number is 123456.
15	hasItemName	<ul style="list-style-type: none"> (I001, XXX) I001 item name is XXX.
16	hasItemQuantity	<ul style="list-style-type: none"> (I001, 100) I001 items quantity is 100.
17	hasItemTotalPrice	<ul style="list-style-type: none"> (I001, 15000) I001 items total price is 15000.
18	hasTotalAmount	<ul style="list-style-type: none"> (XXX , 20000) XXX's total amount is 20000.

19	hasStatus	<ul style="list-style-type: none"> (Raja,Admitted) Raja is the Patient Name Admitted is the status.
20	contains	<ul style="list-style-type: none"> (B001,I002) Bill with bill id B001 as the item with id I002
21	hasSpeciality	<ul style="list-style-type: none"> (XXX,Cardiology) XXX has the speciality in Cardiology
25	hasPatientCondition	<ul style="list-style-type: none"> (XXX,Chronic) Patient has a chronic condition
26	hasTreatmentType	<ul style="list-style-type: none"> (XXX,Surgery) XXX has to go under Surgery.
29	hasDischargeDate	<ul style="list-style-type: none"> (XXX,22-01-2022) XXX got discharged on 22-01-2022.
30	leadsDepartment	<ul style="list-style-type: none"> (XXX,YYY) XXX leads Department YYY
32	hasDegree	<ul style="list-style-type: none"> (XXX,M.B.B.S.) XXX has a M.B.B.S. degree.

ABOX

1. Neha:Nurse,
2. Sameer:Patient,
3. Divya: Nurse,
4. Aniket: Patient,
5. Akash: Security
6. (Neha, Female):hasGender,
7. (Sameer, Male):hasGender,
8. (Akash,Male):hasGender
9. (Akash,Security Officer):hasDesignation
10. (Neha, "Bachelor of Science in Nursing"):hasQualification
11. (Neha, "Head Nurse"):hasDesignation,
12. (Neha, "Emergency Room"):hasDepartment,
13. (Sameer, 45):hasAge,

14. (Sameer, "Broken Arm"):hasDiagnosis,
15. (Sameer, "2023-02-28"):hasAdmissionDate,
16. (Sameer, "Brodipet"):hasStreetAddress,
17. (Sameer, "Guntur"):hasCity,
18. (Sameer, "AP"):hasState,
19. (Sameer, "12345"):hasZIP,
20. (Sameer, I001):hasItem,
21. (Sameer, I002):hasItem,
22. (I001, "Hospital Room"):hasItemName,
23. (I001, 1):hasItemQuantity,
24. (I001, 250):hasItemUnitPrice,
25. (I001, 250):hasItemTotalPrice,
26. (I002, "Medication"):hasItemName,
27. (I002, 10):hasItemQuantity,
28. (I002, 15):hasItemUnitPrice,
29. (I002, 150):hasItemTotalPrice,
30. (Sameer, 400):hasTotalAmount
31. (Divya, Female):hasGender,
32. (Chinmay, Male):hasGender,
33. (Divya, "Bachelor of Science in Nursing"):hasQualification,
34. (Divya, "Nursing Supervisor"):hasDesignation,
35. (Divya, "Cardiology Ward"):hasDepartment,
36. (Chinmay, 35):hasAge,
37. (Chinmay, "Fever"):hasDiagnosis,
38. (Chinmay, "2023-03-30"):hasAdmissionDate,
39. (Chinmay, "123 Main St."):hasStreetAddress,
40. (Chinmay, "Anytown"):hasCity,
41. (Chinmay, "CA"):hasState,
42. (Chinmay, "98765"):hasZIP,
43. (Chinmay, I001):hasItem,
44. (Chinmay, I002):hasItem,
45. (I008, "Medication"):hasItemName,
46. (I008, 5):hasItemQuantity,
47. (I008, 20):hasItemUnitPrice,
48. (I008, 100):hasItemTotalPrice,
49. (Chinmay, 350):hasTotalAmount
50. (Himanshu, Male):hasGender,

51. (Himanshu, MD):hasEducation,
52. (Himanshu, Head_Neurologist):hasDesignation,
53. (Himanshu, Neurology):hasDepartment,
54. (Himanshu, 555-1234):hasPhoneNumber,
55. (Himanshu, Neurology):hasSpecialization
56. (Sakshi, Female):hasGender,
57. (Sakshi, Epilepsy):hasDiagnosis,
58. (Sakshi, 32):hasAge,
59. (Sakshi, discharged):hasStatus,
60. (Sakshi, P109):hasID,
61. (Sakshi, 456_Elm_St):hasStreet,
62. (Sakshi, Anytown):hasCity,
63. (Sakshi, CA):hasState,
64. (Sakshi, 12345):hasZIP,
65. (Sakshi, 2023-01-15):hasAdmissionDate,
66. (Sakshi, 2023-01-25):hasDischargeDate,
67. (B191, 2023-01-25):hasDate,
68. (I131, EEG):hasItemName,
69. (I131, 1):hasItemQuantity,
70. (I135, Anti-seizure_medication):hasItemName,
71. (I135, 30):hasItemQuantity,
72. (I135, 1500.00):hasItemTotalPrice,
73. (B191, 2000.00):hasTotalAmount,
74. (Aditya, Male):hasGender,
75. (Aditya, Migraine):hasDiagnosis,
76. (Aditya, 45):hasAge,
77. (Aditya, admitted):hasStatus,
78. (Aditya, P112):hasID,
79. (Aditya, 789_Oak_St):hasStreet,
80. (Aditya, Anytown):hasCity,
81. (Aditya, CA):hasState,
82. (Aditya, 12345):hasZIP,
83. (Aditya, 2023-02-15):hasAdmissionDate,
84. (B182, 2023-02-15):hasDate,
85. (B182, I145):hasItem,
86. (I145, CT_scan):hasItemName,
87. (I145, 1):hasItemQuantity,

88. (I145, 1000.00):hasItemTotalPrice,
89. (B182, 1000.00):hasTotalAmount,
90. (Reena, Female):hasGender,
91. (Reena, LPN):hasQualification,
92. (Reena, Neurology):hasDepartment

T - Box

1. $\text{staff} \equiv \text{Person} \sqcap (\text{Doctor} \sqcup \text{Nurse} \sqcup \text{Receptionist} \sqcup \text{Security})$
2. $\text{doctor} \sqsubseteq \text{staff}$
3. $\text{Nurse} \sqsubseteq \text{staff}$
4. $\text{Receptionist} \sqsubseteq \text{staff}$
5. $\text{Security} \sqsubseteq \text{staff}$
6. $\text{Bill} \equiv \exists \text{ contains.item}$
7. $\text{Patient} \sqsubseteq \neg \text{staff}$
8. $\text{Doctor} \sqsubseteq \neg \text{security}$
9. $\text{Doctor} \sqsubseteq \neg \text{nurse}$
10. $\text{Nurse} \sqsubseteq \neg \text{receptionist}$
11. $\text{Receptionist} \sqsubseteq \neg \text{doctor}$
12. $\text{Security} \sqsubseteq \neg \text{receptionist}$
13. $\text{Nurse} \sqsubseteq \neg \text{security}$
14. $\text{Person} \equiv \text{male} \sqcup \text{female}$
15. $\text{Male} \sqsubseteq \neg \text{female}$
16. $\text{Department} \sqsubseteq \neg \text{Person}$
17. $\text{Staff} \sqsubseteq \text{person}$
18. $\text{Patient} \sqsubseteq \text{person}$
19. $\text{Item} \sqsubseteq \neg \text{person}$
20. $\text{Patient} \equiv \text{Person} \sqcap \exists \text{ hasDiagnosis.Diagnosis}$
21. $\text{Cardiologist} \equiv \text{Doctor} \sqcap \exists \text{ hasSpeciality.Cardiology}$
22. $\text{Neurologist} \equiv \text{Doctor} \sqcap \exists \text{ hasSpeciality.Neurology}$
23. $\text{PediatricPatient} \equiv \text{Patient} \sqcap (\exists \leq 13 \exists \text{ hasAge})$
24. $\text{MultiSpecialistDoctor} \equiv \text{Doctor} \sqcap (\exists > 1 \exists \text{ hasSpeciality.Specialization})$
25. $\text{DepartmentHead} \equiv \text{Doctor} \sqcap \exists \text{ hasDepartment.Department} \sqcap \exists \text{ leadsDepartment.Department}$
26. $\text{EmergencyPatient} \equiv \text{Patient} \sqcap \exists \text{ hasDepartment.EmergencyRoom}$

27. $TreatmentType \equiv \exists hasTreatmentType.TreatmentType \sqcap (Patient \sqcap (\exists hasMedication.Medication \sqcup \exists hasDiagnosis.Diagnosis))$
28. $PatientDischarged \equiv Patient \sqcap (\exists hasDischargeDate.DischargeDate)$
29. $HospitalCapacity \equiv \exists hasDepartment.Department \sqcap (\exists \leq 500 \exists hasPatient.Patient)$
30. $MaternityPatient \equiv Patient \sqcap (\exists hasDiagnosis.Obstetrics \sqcup \exists hasDiagnosis.Gynecology)$
31. $ChronicPatient \equiv Patient \sqcap hasPatientCondition.Chronic \sqcap (\exists \geq 6 \exists has TreatmentType.TreatmentType)$
32. $PatientRecord \equiv Patient \exists hasDiagnosis.Diagnosis \sqcup \exists has TreatmentType.TreatmentType$

Situation / Example

1. Aniket is a patient admitted to the hospital.
2. Aniket's doctor is John and the nurse assigned is Divya.
3. Doctor John is a specialist in pulmonology and works in the Pulmonology Department.
4. Divya has B.Sc Nursing degree and she lives in Chennai.
5. Richa is a receptionist and she works from 9 am to 6pm.
6. Patient with patient id P008 has the name Aniket.
7. Patient P008 has been prescribed an item I089.
8. Aniket's total bill is Rs.28000.
9. Dinesh has a treatment type Surgery to undergo.
10. Rutuj is a male pediatric patient.