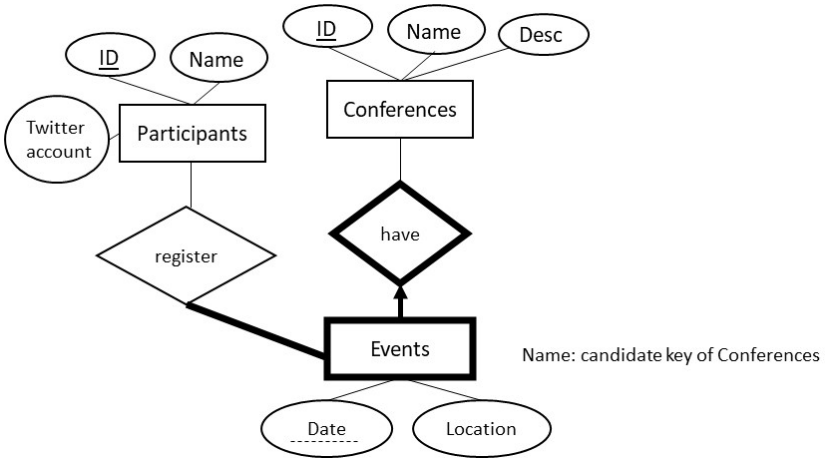
Part 1:

Q1: (10pt)

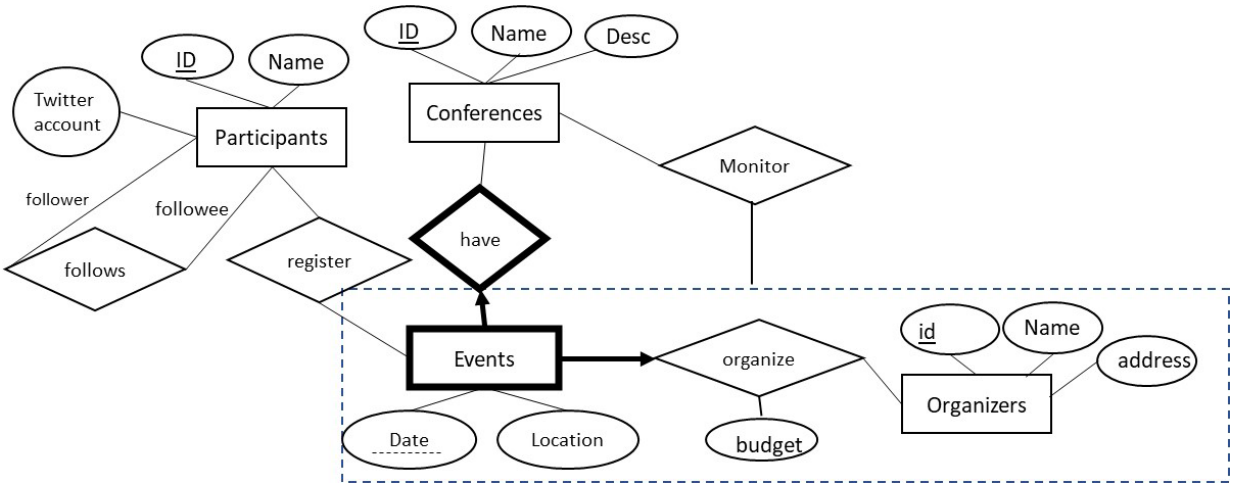
a) (2pt) False
b) (2pt) True
c) (2pt) False; date is the partial key of Events. It needs to be unique for the same conference entity.
d) (2pt) True since ID is the primary key which cannot be null.
e) (2pt) False; no. there are no ER notations for constraints on specific relationship sets or specific entity sets

Q2: (6pt)



a) 1 pt for specifying that name is the candidate key for the Conferences entity set in the ER diagram
b) 5 pt for the bold line (b.1 for 2pt) connecting to the Events entity set (b.2 for 3pt)
c) Deduct 2 points if there is an extra arrow.

Q3:



34 points

a) (6 pt) The Organizers entity set (2pt) with the ID attribute underlined (2pt), the name attribute (1pt) and the address attribute (1pt)

b) (10pt)
- b.1 (4pt) --- The Organize relationship set (1 pt) between Events and Organizers entity sets (1pt), budget attribute (1pt), no bold line from the Organizers side (1pt)
- b.2 (6pt) -- The bold (2pt) arrow (2pt) line from the Events entity set to Organize relationship set (2pt)

c) (10 pt)
- c.1 (4pt)
  Aggregation on the diamond shape representing the Organize relationship set using a dashed rectangle covering the diamond shape. Deduct 1 pt if there is more than one relationship set inside the dashed rectangle.
- c.2 (3pt) Monitor relationship set between the Conferences entity set (1.5pt) and the aggregation in c.1 (1.5pt)
- c.3 (3pt) A thin line for each side (1.5pt) of the monitor relationship set.

d) (8pt)
- d.1 (3pt) A Follow relationship set represented as a diamond shape.
- d.2 (2pt) The diamond shape is between the Participants entity set and itself.
- d.3 (1.5pt) Follower role (1pt) is specified on one side with a thin line (0.5pt).
- d.4 (1.5pt) Followee role (1pt) is specified on the other side with a thin line (0.5pt).

Part 2:

4.a

a.1 (4 points)

OperatingRoom(<u>roomID</u>, building, primary key(roomID)) for the OperatingRoom entity set ; 1 pt for no extra attributes, 1 pt for each attribute

a.2 (8 points)

MedicalDevice(<u>deviceID</u>, make, modelNo, roomID not null, primary key(deviceID), foreign key(roomID) references operatingRoom(roomID))
- a.2.1: 1pt for the MedicalDevice table
- a.2.2: 3pt for the three attributes: deviceID, make, modelNo
- a.2.3: 1 for primary key(deviceID)
- a.2.4: 2pt roomID is a foreign key to OperatingRoom(roomID);
- a.2.5: 1pt roomID is not null due to the total participation constraint

a.3 (5 points) Patient(<u>patientID</u>, name, address, primary key(patientID))
- a.3.1: 1 pt for the Patient table
- a.3.2: 2 pt for the three attributes
- a.3.3: 1 pt for primary key(patientID)
- a.3.4: 1 pt for no extra attributes/extra foreign key

a.4 (15 points) for the ISA hierarchy; the question asks for one table for each entity set in the ISA hierarchy

Answer: One table for each entity set in the ISA hierarchy with the no-covering constraint and the no-overlapping constraints.

- a.4.1: (5 pt) HospitalPersonnel(ID, name, startDate, primary key (ID)); 1 pt for no extra attributes, 1 pt for each attribute, and 1 pt for the primary key
- a.4.2: (5 pt) Doctor(ID, specialty, primary key(ID), foreign key(ID) references HospitalPersonnel(ID) on delete cascade); 1 pt for the table, 1 pt for specialty, 1 pt for the primary key, 1 pt for the foreign key to the correct table, 1 pt for no extra attributes
- a.4.3: (5 pt) Nurse(ID, EducationalCredits, primary key(ID), foreign key(ID) references HospitalPersonnnel(ID) on delete cascade);); 1 pt for the table, 1 pt for specialty, 1 pt for the primary key, 1 pt for the foreign key to the correct table, 1 pt for no extra attributes
- a.4.4: Add 1 pt if specifying on delete cascade with the foreign key in the Doctor or Nurse tables.

If students use a different design:

Design 2: One table for each child entity set does not work here due to the no-covering constraint.

- d2.a.4.1. 5pt for Doctor, 5pt for nurse, each has their primary key and attributes from HospitalPersonnel entity set and its own specific attribute.
- d2.a.4.2 5pt for missing the parent table as the instruction is not followed. The no covering constraint is not enforced by table design when it can be done.

Design 3: One table for all the entity sets in the ISA hierarchy by putting all the attributes from all the entity sets into the table.

HospitalPersonnel(ID, name, startDate, specialty, EducationalCredits, empType, primary key (ID))
empType is introduced; different values can be used to indicate a doctor, a nurse, or other types of personnel. The no-overlapping constraint can be enforced since the attribute empType stores only one of the hospital personnel types and there is only one row for each personnel.

- d3.a.4.1 (3 pt) one table with the primary key ID
- d3.a.4.2 (3 pt) for the five attributes
- d3.a.4.3 (4 pt) for the empType attribute (2pt) and the explanation of the values to show the no-covering constraint (2pt)
- d3.a.4.4: (5pt) does not have each table for each entity set per the instruction

a.5 (12 points) Undergone(deviceID,patientID,ID,datetime,videofilename)
- a.5.1 (3pt) Primary key(deviceID, patientID, ID); 1 pt deduction for any extra attributes
- a.5.2 (2pt) deviceID is a foreign key to MedicalDevice(deviceID).
- a.5.3 (2pt) patientID is a foreign key to Patient(patientID).
- a.5.4 (2pt) ID is a foreign key to HospitalPersonnel(ID).
- a.5.5 (2pt) for datetime and videofilename attributes
- a.5.6 (1pt) for no extra attributes or no extra foreign keys

4.b (4 points)

- 4.b.1 (2pt) The no-overlapping constraint cannot be enforced. The same ID value can be entered in both Doctor and Nurse tables.
    - If students use Design 3: A check needs to be made to ensure that the values for the attributes for each type of personnel are entered correctly. For instance, a doctor does not have the continuing credit and a nurse does not have specialty. The schema design cannot enforce this.
- 4.b.2 (2pt) The total participation of the Patient entity set into the undergone procedure relationship set.