IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 2015

BEng Honours Degree in Computing Part I
MEng Honours Degrees in Computing Part I
for Internal Students of the Imperial College of Science, Technology and Medicine

This paper is also taken for the relevant examinations for the Associateship of the City and Guilds of London Institute

PAPER C130

DATABASES

Monday 11 May 2015, 10:00
Duration: 80 minutes

Answer ALL TWO questions

Paper contains 2 questions
Calculators not required

1 *Given the following relations:*

Festival(name, year, attendance)
Band(name, style)
Stage(name, audiencesize, location)
Performs(bandname, festivalname, festivalyear, stagename, performancetime, performancedate)

bandname references Band.name

(festivalname, festivalyear) references Festival.name & Festival.year

stagename references Stage.name

Musician(name, dateofbirth, artistname)
Member(musicianname, musiciandateofbirth, bandname)

(musicianname, musiciandateofbirth) references Musician.name & Musician.dateofbirth

bandname references Band.name

For each question below, write an SQL query:

a List the names of each festival along with the year it took place.

b Count the number of different musicians.

c Show all information about each festival (festival name, bands playing at the festival, stage they perform on and members of the band) in the order of their performance (time & date).

d Display all information about performances at Glastonbury (what band plays on what stage at what time).

e List per band where they will be playing in 2016.

f Select all data of all bands (band name) and, if that band has played at any festival in 2012, show all data about these festivals (festival name and year).

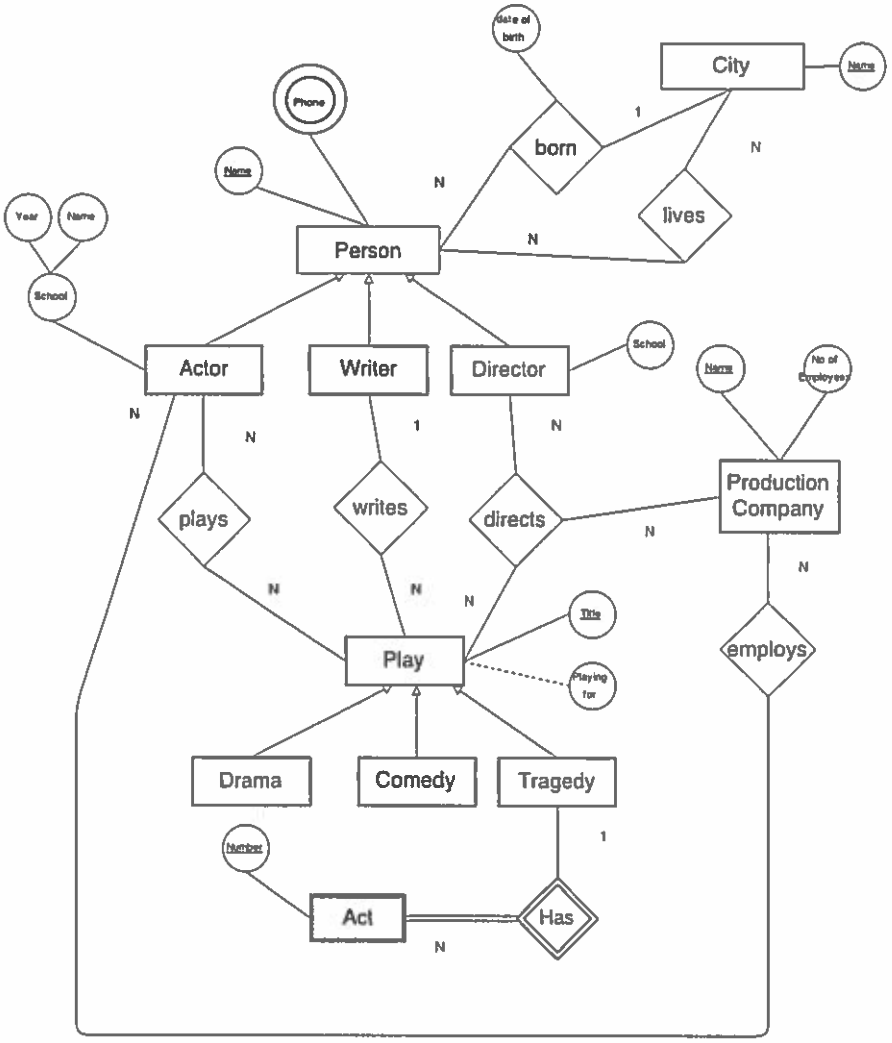
g List the names of all bands not playing at any festival in 2012. Use a nested query.

h List the names of all festivals where the Arctic Monkeys did not play in 2012.

i Display all information (festival name and attendance) about the festivals(s) with the highest attendance.

All questions carry equal weight.

2 a *Given the following E-R Model:*



Write the equivalent relational model including table names, column names, primary keys (underlined), foreign keys as well as triggers, e.g.:

table(<u>column1</u>, column2)

column2 references othertable.column3 on delete cascade

b (i) Suppose that we decompose the schema $R = (A, B, C, D, E)$ into (A, B, C) and (A, D, E).

Show that this decomposition is a lossless-join decomposition if the following set F of functional dependencies holds:

$$A \rightarrow BC$$
$$CD \rightarrow E$$
$$B \rightarrow D$$
$$E \rightarrow A$$

(ii) Compute the closure of the following set F of functional dependencies for relation schema $R = (A, B, C, D, E)$.

$$A \rightarrow BC$$
$$CD \rightarrow E$$
$$B \rightarrow D$$
$$E \rightarrow A$$

Also list the candidate keys for R.

(iii) Using the functional dependencies:

$$A \rightarrow BC$$
$$CD \rightarrow E$$
$$B \rightarrow D$$
$$E \rightarrow A$$

compute a canonical cover.

The two parts carry 40% and 60% of the marks.