



**Wednesday 5 December 2018  
9:30 am – 11:00 am  
(Duration: 1 hour 30 minutes)**

**DEGREES of MSci, MEng, BEng, BSc, MA and MA (Social Sciences)**

## **CS1F Computing Fundamentals**

**(Answer All Questions)**

**This examination paper is worth a total of 50 marks**

**(Use SEPARATE ANSWER BOOKS for sections A and B)**

**The use of a calculator is not permitted in this examination**

### **INSTRUCTIONS TO INVIGILATORS**

**Please collect all exam question papers and exam  
answer scripts and retain for school to collect.  
Candidates must not remove exam question papers.**

## SECTION A – Information Management

1. (a) Provide descriptions of any THREE of the following terms. You MUST use examples and/or diagrams to illustrate your answers.

[9]

- (i) The degree and cardinality of a relation.
- (ii) A foreign key in the context of a relational database.
- (iii) A many-to-many relationship in an ER diagram.
- (iv) The relational algebra operator  $\times$ .

- (b) A tennis tournament contains a number of players; each player has a name, and can be uniquely identified by their Association Membership number. There is a sequence of scheduled matches on various times & days (numbered from 1). Each match involves exactly 2 players, and each player scores a number of points in that match. Each match must be associated to a given court. Each tennis player must also have a coach, who we know the (unique) name of. Coaches can coach multiple players. Both courts and matches have unique numbers. Not all courts will be used during a competition.

Draw an ER diagram to represent this scenario.

[5]

How would you represent the relationship between players and matches? Show the relevant part of the relational database schema.

[3]

- (c) Assume a relational database with three tables, as follows:

Staff(NI\_Num, Firstname, Surname, PartTime, Dept)

Department(DeptNum, Name, Building)

Building(BuildingId, StreetNum, StreetAddress, City)

where Staff.Dept is a foreign key reference to Department.DeptNum and Department.Building is a foreign key reference to Building.BuildingId.

- (i) Write a relational algebra expression to find the surnames of all staff who work in department 5.

[1]

- (ii) Write the SQL query to find the names of the departments based in Glasgow city.

[2]

- (iii) Write the SQL query to find how many part time staff work in each department number.

[2]

(d)

(i) Consider relations S & T with the following schema:

S(A, B)

T(C, D)

Let  $S = \{ \langle a, 1 \rangle, \langle b, 2 \rangle \}$  and  $T = \{ \langle 2, x \rangle \}$ .

What is  $|S|$ ?

[1]

Give the contents of the relation obtained by the relational algebra expression  $S \bowtie_{B=C} T$ .

[1]

(ii) Express as a Venn diagram the union of sets X and Y.

[1]

## SECTION B – Human Computer Interaction

2. This question is about HCI *design* and *evaluation techniques*. Consider the following scenario: You are working on the development of a new student registration system.
- (a) Develop a persona for this system. [6]
  - (b) Describe how you would conduct and analyse a heuristic evaluation of this system. [5]
  - (c) How many evaluators would you recruit and why? [2]
  - (d) You want to run a user study to evaluate how successful the new system is in helping students register as compared to the old system. Describe an experimental design of this comparison, including the dependent and independent variables. [4]
  - (e) What kind of sample does your experimental design use and why? [2]
  - (f) As part of your evaluation, you also complete an interview to collect qualitative data. What kind of interview would you choose to complete and why? [3]
  - (g) What process would you use to analyse your interview data? [3]