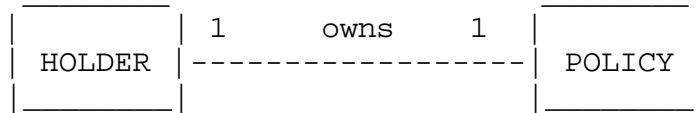


Computer Science 2 Test - Database, Third Term 2002.

PLEASE WRITE IN INK, NOT IN PENCIL. Marks are shown in []. Max Mark : 45.

Q1 [3,3=6] (a) Given the following ER diagram (in part (b)), what two assertions (statements) can be made about the entities shown in terms of their participation ? (Note : statements about connectivities and cardinalities are not asked for).

(b) Show (write down) one instance (occurrence) of the following ER model :



Q2 [3,3=6] Consider the following relations Y_TAB, SALE and PRODUCT.

Y_TAB					SALE				
A	B	C	D	E	DATE	CUST_ID	SALPERS_ID	PROD_ID	QTY
a1	b2	c1	d3	e2	28/02	100	10	2241	200
a2	b2	c3	d3	e4	12/02	101	23	2518	300
a1	b3	c2	d1	e2	15/02	101	23	1035	150
a2	b4	c5	d1	e5	19/02	100	39	2518	200
					02/02	101	23	1035	200
					05/02	105	10	2241	100
					22/02	110	37	2518	150
					14/02	105	10	2249	50
					01/02	101	23	2249	75
					04/02	101	23	2241	250

PRODUCT				
PROD_ID	PROD_DESC	MANUFACTR_ID	COST	PRICE
1035	Sweater	210	1.25	2.00
2241	Table Lamp	317	2.25	3.25
2249	Table Lamp	317	3.55	4.80
2518	Sculpture	253	0.60	1.20

(a) From the following list, write down the functional dependencies that do NOT apply to (i.e. are not true for) Y_TAB (simply write down the number given in brackets next to the dependency given, e.g. write down "5,6" if you think numbers 5 and 6 are false).

- (1) A --> C (2) D --> E (3) C --> A (4) E --> B
 (5) E --> A (6) C --> B (7) B --> D

(b) Given the following SQL code, write down the dimensions of the resultant output (i.e. how many rows and how many columns). Please explain your reasoning.

```
select * from Y_TAB, SALE, PRODUCT;
```

Q3 [4,2=6] (a) Two major principles of modern database design were highlighted by the hierarchical model. What are these two principles ? (two or three words are enough here if they are the right words !)

(b) Here are two tables, Product_Table and Vendor_Table, which form part of a database. Is there an integrity problem here, and if so, what ? Explain your answer.

Product_table

Prod_Code	Prod_Desc	Prod_Price	Prod_on_Hand	Vend_Code
001278-AB	Claw Hammer	12.95	23	282
123-21UUY	Chain Saw	189.99	4	285
QER-34256	Sledge Hammer	18.63	6	281
SRE-657UG	Rat-tail file	2.99	15	282
ZZX3245-Q	Steel Tape	6.79	8	285

Vendor_table

Vend_Code	Vend_Contact	Vend_Areacode	Vend_Phone
230	Shelly K. Smithson	608	555-1234
231	James Johnson	615	123-4536
232	Annelise Crystal	608	224-2134
233	Candice Wallace	904	342-6567
234	Arthur Jones	615	123-3324
235	Henry Ortozo	615	899-3425

Q4. [9] A database is to be set up to record information about manufacturing a specific product. Data about the following are to be recorded : the machines, setup times, production times and name and amount of each ingredient used in manufacturing each specific product.

Three machines and two ingredients are used in any one product (in other words, three machines are used per product; two ingredients are used per product). The attributes identified by a system analyst are presented below :

```

PRODNUM   Product number (unique)
DESC      Product description

MACNUM1   Id-Number of first machine used
SETUP1    Setup time for first machine
PRORATE1  Production time for first machine

MACNUM2   Id-Number of second machine used
SETUP2    Setup time for second machine
PRORATE2  Production time for second machine

MACNUM3   Id-Number of third machine used
SETUP3    Setup time for third machine
PRORATE3  Production time for third machine

IGD1      Id-Number of first ingredient used
AMT1      Amount of first ingredient used

IGD2      Id-Number of second ingredient used
AMT2      Amount of second ingredient used

```

The dependencies are :

```

PRODNUM, MACNUM --> SETUP
PRODNUM, MACNUM --> PRORATE
PRODNUM         --> DESC
PRODNUM, IGD   --> AMT

```

The universal relation appears as follows : Products(Prodnum, Desc, Macnum, Setup, Prorate, Igd, Amt).

Place this data into 3rd normal form, explaining your reasoning for each step.

Q5 [8] Here are four versions of some SQL code, which applies to the table EMP immediately below (the same EMP table as you have been using in your pracs). Write down in each case what would happen / what the output would be when the code is run.

```
(a) select ename, sal from emp where sal >
(select sal from emp where deptno = 20)
order by ename desc;
```

```
(b) select ename, sal from emp where sal < any
(select sal from emp where deptno = 30)
order by ename;
```

```
(c) select ename, sal from emp where sal < all
(select sal from emp where deptno = 30)
order by ename;
```

```
(d) select ename, sal from emp where sal > all
(select sal from emp where deptno = 30)
order by ename desc ;
```

EMP

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7329	smith	clerk	7902	1990-12-17	800		20
7499	allen	salesman	7698	1999-02-20	1600		30
7521	ward	salesman	7698	1999-02-22	1250	500.00	30
7566	jones	manager	7839	1999-04-02	2975		20
7654	martin	salesman	7698	1999-09-28	1250	1400.00	30
7698	blake	manager	7839	1999-05-01	2850		30
7782	clark	manager	7839	1991-06-09	2450		10
7788	scott	analyst	7566	1992-12-09	3000		20
7839	king	president		1991-11-17	5000		10
7844	turner	salesman	7698	1991-09-08	1500		30
7878	adams	clerk	7788	1983-01-12	1100		20
7900	james	clerk	7698	1991-12-03	950		30
7902	ford	analyst	7566	1991-12-03	3000		20
7934	miller	clerk	7782	1992-01-23	1300		10

where "DEPT" = Department, "EMP" = Employee, "LOC" = location, "ENAME" = employee name, "MGR" = manager, "SAL" = weekly salary, "COMM" = commission.

Q6 [2,2,2,2,2 = 10] The following are extracts from tables which form part of a relational database designed to support the information processing requirements of a mythical University.

DEPARTMENT				STAFF			
DEPT	DBLDG	DOFFICE	DHODSNO	ENAME	ETITLE	ESALARY	DEPT
THEO	HU	200	10	LUKE	PREACHER	12000	THEO
CIS	SC	300	80	MARK	SECRETARY	8000	THEO
MGT	SC	100	-	MATTHEW	TECHNICIAN	12000	THEO
PHIL	HU	100	60	DICK	MESSENGER	9000	PHIL
PHYS	SC	400	70	HANK	JESTER	13000	DRAMA
				EUCLID	LECTURER	10000	MATHS
				ARCHIMEDES	LAB ASSIST	8000	ENGIN
				DA VINCI	LAB ASSIST	7000	PHYS

where DEPT = department name, DBLDG = department building, DOFFICE = departmental secretary's office, DHODSNO = staff-number of head of department, CIS = Computer Information Systems, HU = Humanities, SC = Sciences, PHIL = Philosophy, MGT = Management, Esalary = monthly salary.

COURSE

CNO	CNAME	CDESC	CRED	CLABFEE	CDEPT
C11	INTRO TO CS	FOR ROOKIES	3	100	CIS
C22	DATA STRUCTURES	ESSENTIAL	3	50	CIS
C33	DISCRETE MATHS	ABS NECESSARY	3	0	MATHS
C44	DIGITAL CIRCUITS	FUNDAMENTAL	3	0	CIS
C55	COMPUTER ARCHITECTURE	VON NEUMANN'S MACH	3	100	MATHS
C66	RELATIONAL DATABASE	THE WAY TO GO	3	500	CIS
P11	EMPIRICISM	SEE IT - BELIEVE IT	3	100	PHIL
P22	RATIONALISM	FOR CIS MAJORS	3	50	PHIL
P33	EXISTENTIALISM	FOR CIS MAJORS	3	200	ENGIN
P44	SOLIPSISM	SELF-KNOWLEDGE	6	0	PHYS
T11	SCHOLASTICISM	FOR THE PIOUS	3	150	THEO
T22	FUNDAMENTALISM	FOR THE LITERALISTS	3	90	THEO

where CNO = course number, CNAME = course name, CDESC = course description, CRED = the number of credits a student earns by passing the

course, CLABFEE = the laboratory fee in Rand paid by each student who takes the course, DEPT = the academic department that offers the course, PHIL = Philosophy.

What SQL commands would you use in order to perform the following queries on the above data base ?

(a) display the course name and labfee for all courses offered by the philosophy department. Sort the result by course name in descending sequence.

(b) display all information about any three-credit course with a lab fee which is less than R100 or greater than R300.

(c) display all information about any staff member whose name begins with the letters "MA".

(d) how many courses are offered by the maths department and what is the total labfee for these courses ?

(e) display the staff-number of the head of the department which gives the course called "SOLIPSISM".