



إسم الطالب/ة: إنتصار خالد البنا

Final Exam  
Question Paper  
(Total Points:25)

رقم الطالب/ة 20170295

### **FIRST QUESTION :**

The following Database holds information about the faculty of ENG&IT at Al-Azhar University-Gaza :

#### **58Major :**

MajCode	MajName
CE	Comp. Engineering
CS	Comp. Science
ME	Mechatronics Engineering
BIS	Business Information System
RE	Robotics Engineering

#### **Lecturer :**

LecNo	LecName
L1	Ali
L2	Mohammed
L3	Kalid
L4	Mohammed

#### **Course :**

CrsNo	CrsName	CrsCredit
CS1	Database	4
CE2	Software Eng.	3
CS3	Data Structure	3
BIS2	Management	4
CS5	Assembly	3

#### **LecCourse :**

LecNo	CrsNo	SectionNo
L1	CS1	1
L3	CS5	2
L2	BIS2	1
L1	CS1	2
L4	CS5	1

#### **Student :**

StudNo	StudName	Sex	Address	MajCode
S1	Waleed	M	Gaza	CE
S2	Hassan	M	Rafah	CS
S3	Lyla	F	Gaza	CS
S4	Hassan	M	Gaza	BIS
S5	Suzan	F	Rafah	BIS
S6	Reem	F	Rafah	ME

#### **Mark :**

StudNo	CrsNo	Total	SectionNo
S1	CS1	72	2
S4	BIS2	56	1
S3	CS1	55	1
S4	CS5	80	2
S1	BIS2	93	1
S1	CS5	75	1

To answer the following questions refer to the sample DB provided :

A- Determine the primary key and the foreign keys ( if exist ) for each relation.

RELATION	PRIMARY KEY	FOREIGN KEY
Major	<b>MajCode</b>	<b>non</b>
Lecturer	<b>LecNo</b>	<b>non</b>
Course	<b>CrsNo</b>	<b>non</b>
LecCourse	{ <b>LecNo</b> , <b>SectionNo</b> }	<b>CrsNo</b> , <b>LecNo</b>
Student	<b>StudNo</b>	<b>MajCode</b>
Mark	{ <b>StudNo</b> , <b>CrsNo</b> }	<b>StudNo</b> , <b>CrsNo</b>

B- Identify the relationships between :

Student : Major      \*....1  
Major : Course      1...\*  
Lecturer : Course    \*....1

C- Express each of the following queries in the relational algebra queries :

1- List male student numbers, student names and course names, in which the student failed.

A) انتصار خالد الب

$$R_1 = \pi \left( \sigma_{\text{Total} < 60} (\text{mark}) \right)$$

StudNo, CrsNo

$$R_2 = \pi \left( R_1 \bowtie \left( \sigma_{\text{sex} = \text{M}} (\text{student}) \right) \right)$$

$R_1.\text{studNo} = \text{student}.\text{studNo}$   
StudNo, CrsNo, StudName

$$R = \pi \left( R_2 \bowtie \text{Course} \right)$$

$R_2.\text{CrsNo} = \text{student}.\text{studNo}$   
CrsName, StudNo, StudName

2- Determine all courses , that lecturer with LecNo "L1" teaches.

انتخاب كردن اساتيد

ب)

$$R_1 = \pi_{\text{LecNo}, \text{CrsNo}} (\sigma_{\text{LecNo} = L_1}(\text{Lec course}))$$

$$R = \pi_{\text{CrsNo}, \text{CrsName}, \text{CrsCredit}} (R_1 \bowtie \text{course})$$

$R_1 \cdot \text{CrsNo} = \text{course} \cdot \text{CrsNo}$

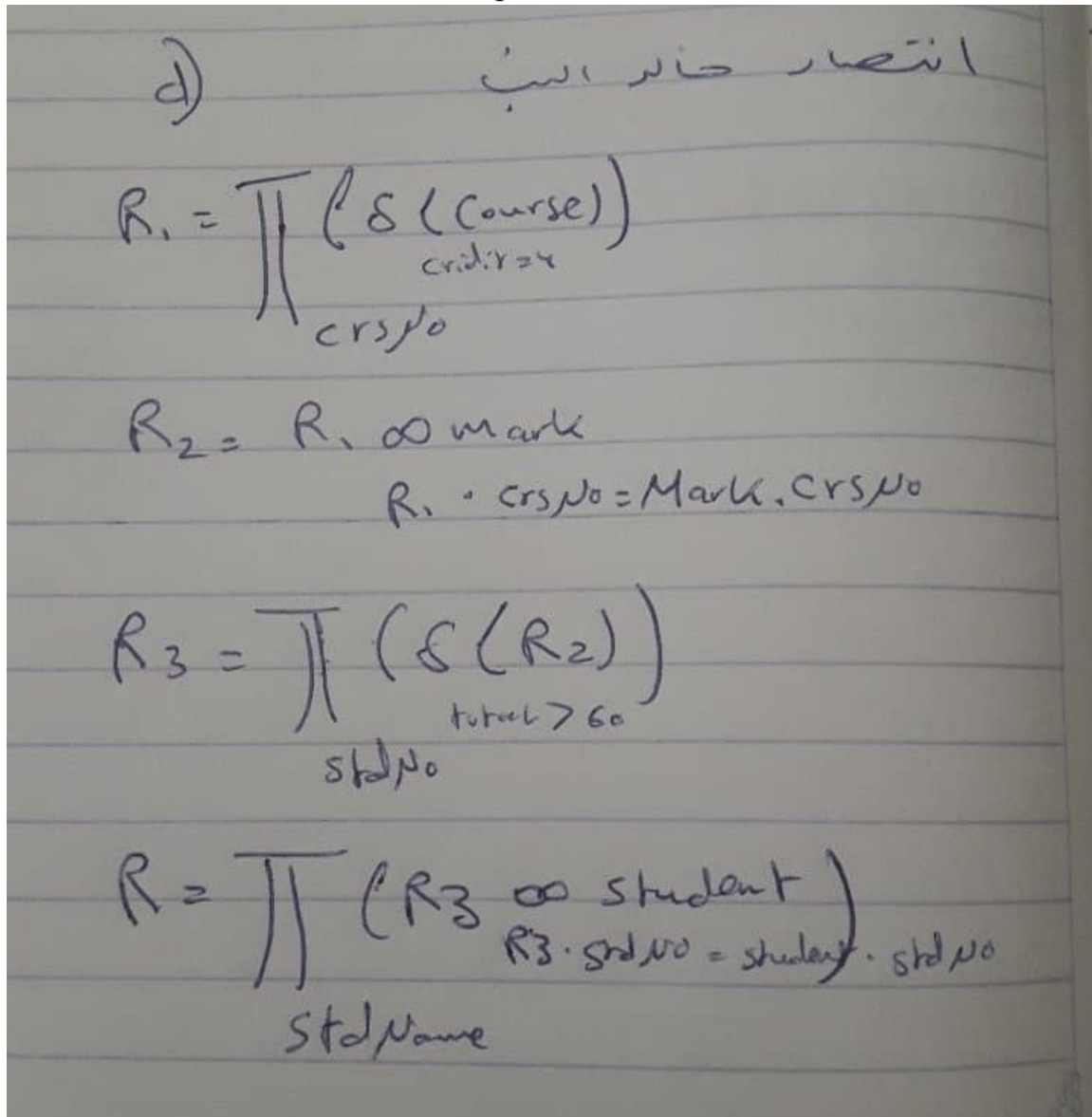
3- List all course numbers and course names with 3 credit .

انتخاب كردن اساتيد

ج)

$$R = \pi_{\text{CrsNo}, \text{CrsName}} (\sigma_{\text{CrsCredit} = 3}(\text{course}))$$

4- Determine all student names, who passed all courses with 4 credit .



## SECOND QUESTION :

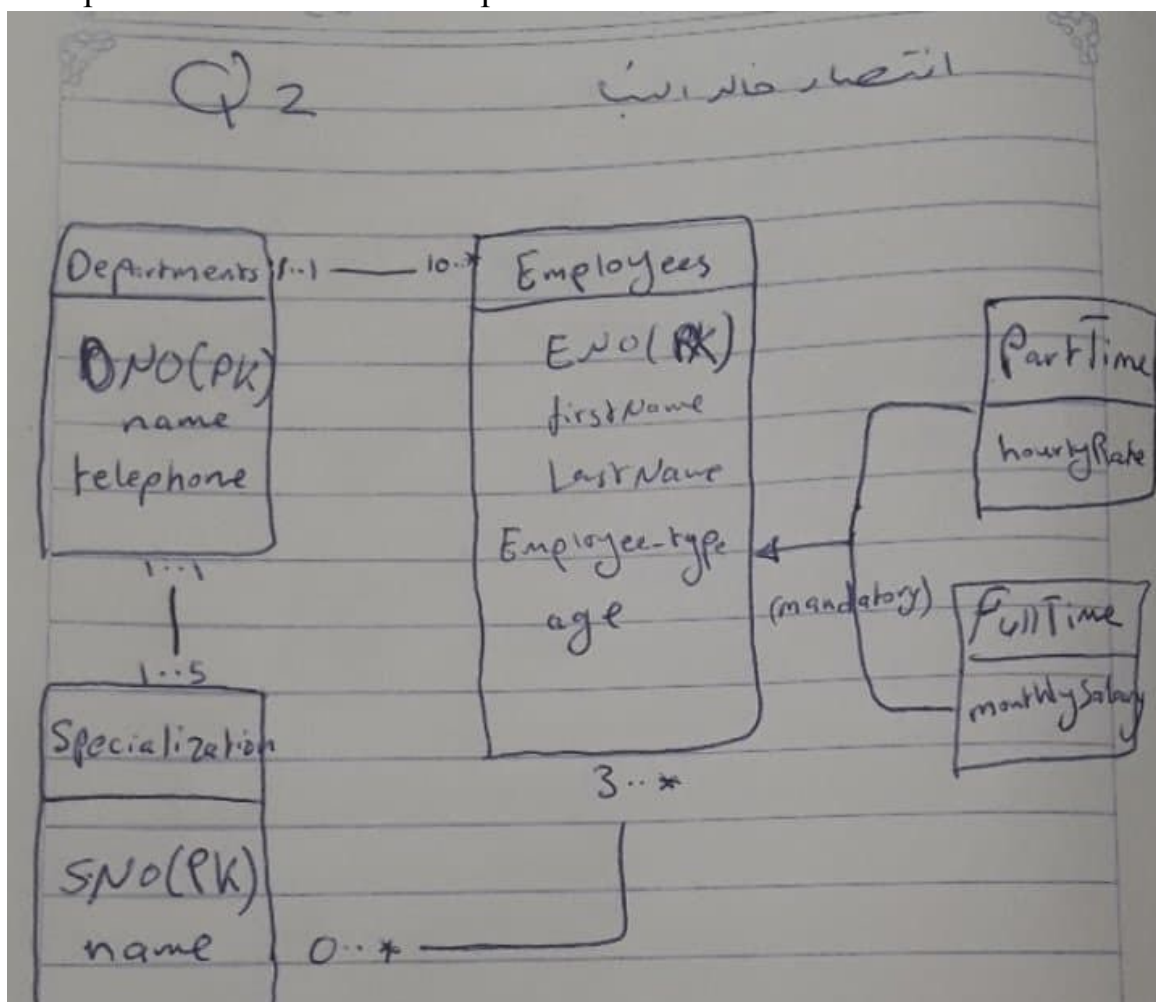
You have to design an EER-Diagram for any faculty at any university, which consists the following entity types :

- 1- Departments are identified by unique DNO, names and telephone.
- 2- Employees are identified by unique ENO, names ( firstname and lastname ) , Employee-Type (academic or administrative ) and ages.
- 3- Specialization ( e.g. BIS , SE , Mechatronics...) are identified by unique SNO, and names.

Add the following information as relationships with associated attributes and mark the multiplicity constraints whenever possible :

- 1- A Department may provide several Specializations ( maximum : 5 Specializations ) , but each Specialization belongs to a single Department.

- 2- A Department has many employees, but each employee is assigned to only one Department. To be classified as a Department, at least 10 employees must be assigned to it. Each of the Department is headed by one of its employees.
- 3- An employee may be assigned to many Specializations ( or to none at all ), and each Specialization has at least 3 employees assigned to it.
- 4- An employee must be classified as full-time or part-time employee, where a full-time employee identified by monthly salary and a part-time employee identified by hourly rate.
- 5- A Department has at least 3 telephone numbers.



### THIRD QUESTION :

An agency called **INSTANT COVER** supplies part-time staff to hotels within GAZA STRIP. The following relation lists the time spent by agency staff working at various hotels. The National Insurance Number (NIN) is unique for every member of staff.

(HINT : the relation is in 1NF , and NIN ContractNo defined as Primary key of R  
اعتبر البيانات الموجودة في الجدول كوسيلة مساعدة لك لمعرفة ضوابط النظام

R ( NIN , ContractNo , Hours , Ename , HotNo , HotLoc , MaritalStatus )

R :

NIN	ContractNo	Hours	Ename	HotNo	HotLoc	MaritalStatus
1135	C1024	16	Ali	H25	Gaza	Married
1057	C1024	24	Fuad	H25	Gaza	Single
1068	C1025	28	Lyla	H4	Rafah	Single
1135	C1025	15	Ali	H4	Rafah	Married
1057	C1026	24	Fuad	H6	Gaza	Single
1135	C1027	10	Ali	H25	Gaza	Married

**A-** Find out the functional dependencies FD's of the relation.

**Functional dependencies**

**In the given relation R**

**HotLoc is dependent on HotNo**

**MaritalStatus,Ename is dependent on NIN**

**Hours is depends on ContractNo,NIN and HotNo**

**B-** Create a Data Base whose tables are at least in 2NF.

**After removing all functional dependencies below are tables in 2NF.**

**1.Table Name :Hotel**

**Description :** This table stores hotel details like HotNo and HotLoc

**Schema :** Hotel (HotNo,HotLoc)

**FD :** HotNo==>HotLoc

**Below is the table data**

**FD :** NIN ==>Ename,MaritalStatus

**Table of data**

NIN	Ename	MaritalStatus
1135	Ali	Married
1057	Fuad	Single
1068	Lyla	Single

C- Create a Data Base whose tables are at least in 3NF.

Above table needs to normalize into 3NF to remove transitive dependency.

Below are tables in 3NF.

### 1.Table Name :Hotel

**Description :**This table stores hotel details like HotNo and HotLoc

**Schema :**Hotel (HotNo,HotLoc)

**FD :**HotNo==>HotLoc

Below is the table data

HotNo	HotLoc
H25	Gaza
H4	Rafah
H6	Gaza

### 2.Table Name :Staff

**Description :**This table stores staff details like NIN ,Ename,MaritalStatus

**Schema :**Staff(NIN ,Ename,MaritalStatus)

**FD :**NIN ==>Ename,MaritalStatus

Below is the table data

NIN	Ename	MaritalStatus
1135	Ali	Married
1057	Fuad	Single
1068	Lyla	Single

### 3.Table Name :Contact

**Description :** This table stores staff and contract details for the hotel.

**Schema :** Contract(ContractNo,NIN,HotNo,Hours)

**FD :** ContractNo,HotNo,NIN ==>Hours

**Below is the table data**

ContactNo	NIN	HotNo	Hours
C1024	1135	H25	16
C1024	1057	H25	24
C1025	1068	H4	28
C1025	1135	H4	15
C1026	1057	H6	24
C1027	1135	H25	10

**FORTH QUESTION :**

Fill the missing actions in the following transaction using the idea of **2PL** technique :

```
BEGIN Transaction
rlock ( A )
  read(A)
wlock ( B )
  read(B)
  B = B / A
  wlock ( A )
  write ( B )
  unlock ( B )
rlock ( R )
  read(R)
  read(A)
  A = A * R
  write ( A )
  unlock ( R )
Commit TA
```



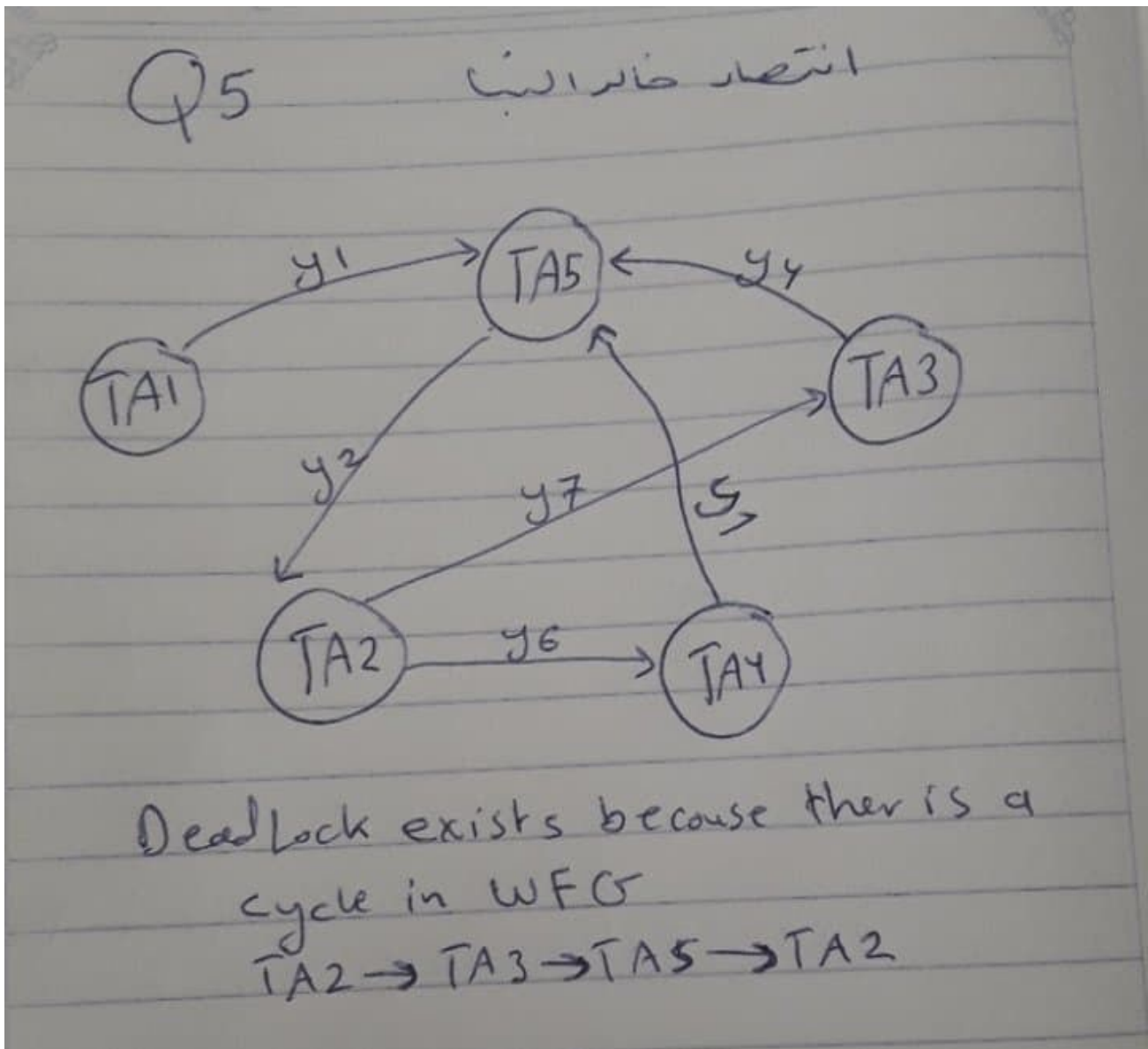
### FIFTH QUESTION :

Produce ( ارسـم ) a **WFG** for the following transactions and determine whether deadlock exists :

Where TA1 , TA2 , TA3 , TA4 , TA5 are working concurrently.

TRANSACTION	Data item locked by transaction الماضي	Transaction is waiting to lock data item الحاضر
TA1		wLock(Y1) , rLock(Y2)
TA2	rLock(Y2) , wLock(Y9)	rLock(Y6) , wLock(Y7)
TA3	wLock(Y7)	rLock(Y3) , wLock(Y4)
TA4	wLock(Y6)	wLock(Y1)
TA5	wLock(Y1) , wLock(Y4)	wLock(Y2)

**HINTS :** ( rLock() : For read lock , wLock() : For write lock )

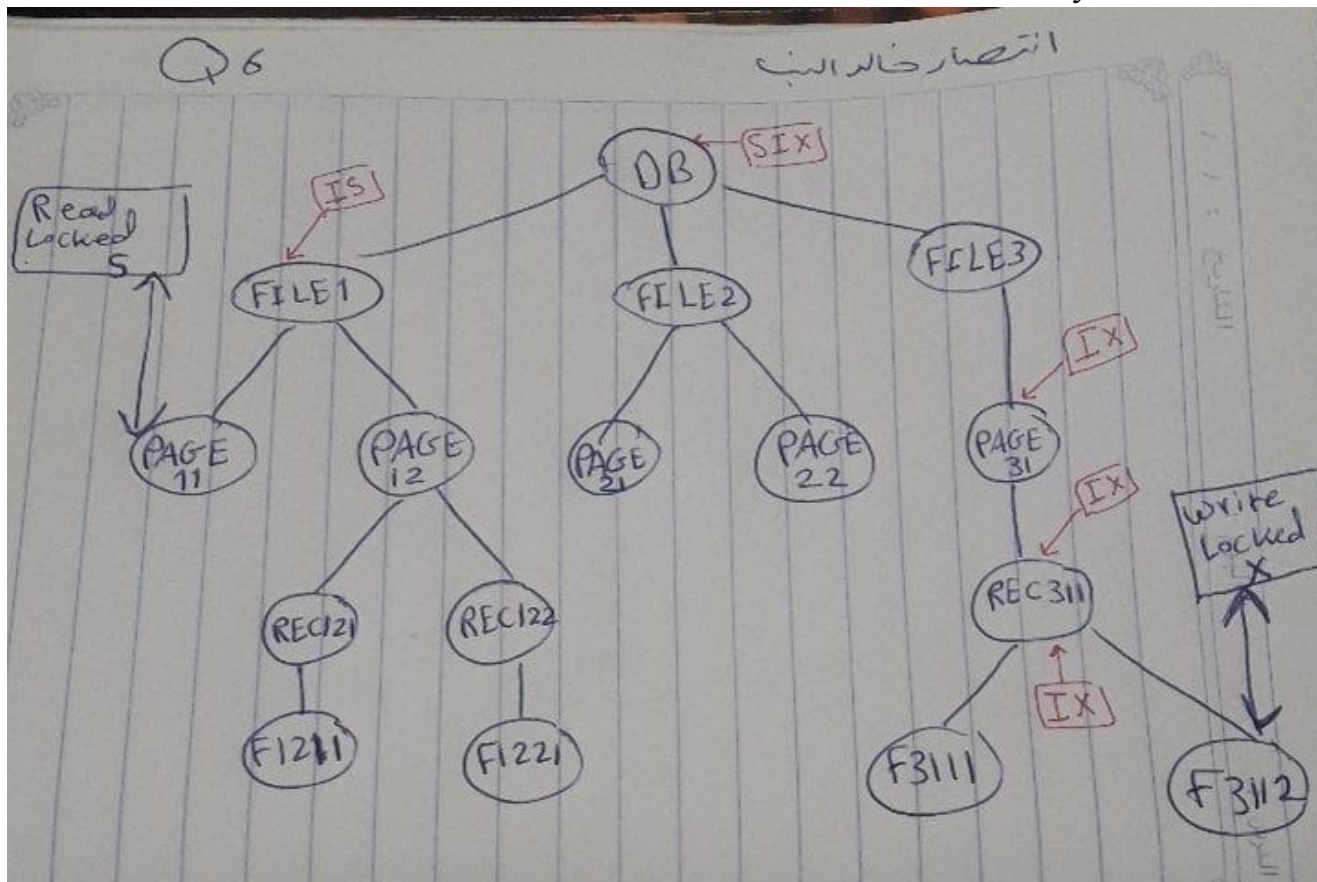


## SIXTH QUESTION :

Given following hierarchy of granularity for locking , where PAGE11 read-locked, and F3112

write-locked :

1- Mark the nodes with intention locks for read or write where necessary.



2- which of the following lock-requests could be granted ( Tick with **YES** or **NO** ) :

DATA ITEM	READ LOCK granted ?	WRITE LOCK granted ?
DB	<b>NO</b>	<b>NO</b>
FILE1	<b>YES</b>	<b>NO</b>
FILE3	<b>NO</b>	<b>NO</b>
PAGE12	<b>YES</b>	<b>YES</b>
PAGE31	<b>NO</b>	<b>NO</b>
REC121	<b>YES</b>	<b>YES</b>
REC311	<b>NO</b>	<b>NO</b>
F1221	<b>YES</b>	<b>YES</b>
F3111	<b>YES</b>	<b>YES</b>
PAGE22	<b>YES</b>	<b>YES</b>