Music Database Relations	
Musicians {Mno, MName, MDoB, MCountry}	PK [Mno]
Compositions {Cno, CTitle, CMno, CDate}	PK [Cno]; FK [CMno references **Musicians**]
Ensembles {Eno, EName, ECountry, EMnoMgr}	PK [Eno]; FK [EMnoMgr references **Musicians**]
Performances {Pno, PDate, PCno, PCity, PCountry, PEno}	CKs [PDate, PEno], [Pno] ; FK [PCno references **Compositions**]; FK [PEno references **Ensembles**]
Ensemble_Members {EmEno, EmMno, EmInstrument}	PK [EmEno, EmMno]; FK [EmEno references **Ensembles**]; FK EmMno references **Musicians**]

1.
Prepare a database specification (either a RAL or an ESG showing database-related details only) for the database. This database specification may be refined by introducing a sixth relational table, and adjusting three other tables to each have a foreign key that references this additional table.

1a. Identify the additional table that is required, and clearly describe the adjustments that need to be made to three tables in order to had a normalized database. [08]

Insert a **Countries** table; then adjust tables **Musicians**, **Performances**, and **Ensembles** to each have a foreign key referencing the Countries table. These adjustments will render the database normalized to BCNF.

1b. Propose an ESG or RAL that provides specifications for the six relational tables of the music database. [36]

Music Database Relations-Attributes List

Relation	Attributes	Attribute Characteristics	Primary Key / Reference
Countries	CntryCd	Alpha, 4	CntryCd
	CntryName	Variable Alpha, 40	
Musicians	Mno	Numeric, 8	Mno
	MName	Variable Alpha, 45	
	MDoB	Numeric, 8	
	MCountry	Alpha, 4	References Countries.CntryCd
Compositions	Cno	Numeric, 8	Cno
	CTitle	Variable Alpha, 30	
	CMno	Numeric, 8	References Musicians.Mno
	CDate	Numeric, 8	
Ensembles	Eno	Alpha, 4	Eno
	EName	Variable Alpha, 30	
	ECountry	Alpha, 4	References Countries.CntryCd
	EMnoMgr	Numeric, 8	References Musicians.Mno
Performances	Pno	Numeric, 8	Pno
	PDate	Numeric, 8	
	PCno	Numeric, 8	References Compositions.Cno
	PCity	Variable Alpha, 30	
	PCountry	Numeric, 4	References Countries.CntryCd
	PEno	Alpha, 4	References Ensembles.Eno
Ensemble_Members	EmEno	Alpha, 4	References Ensembles.Eno
	EmMno	Numeric, 8	References Musicians.Mno
	EmInstrument	Variable Alpha, 30	PK [EmEno, EmMno]

2.

2a. Write appropriate SQL statements to create the tables specified in the figure (you may assign appropriate column types and lengths); also include important integrity constraints. Use your SQL statements to create the tables. [36]

```
CREATE TABLE Countries
(CntryCd CHAR (4) NOT NULL,
CntryName VARCHAR2 (40) NOT NULL,
CONSTRAINT CountryPK PRIMARY KEY (CntryCd));

CREATE TABLE Musicians
(Mno NUMBER (8,0) NOT NULL,
MName VARCHAR2 (45) NOT NULL,
MDoB NUMBER (8,0),
Mcountry CHAR(4),
CONSTRAINT MusicianPK PRIMARY KEY (Mno),
CONSTRAINT MusicianFK1       FOREIGN KEY (MCountry) REFERENCES Countries (CntryCd));

CREATE TABLE Compositions
(Cno NUMBER (8,0) NOT NULL,
CTitle VARCHAR2 (30) NOT NULL,
CMno NUMBER (8,0),
CDate NUMBER (8,0),
CONSTRAINT CompositionPK    PRIMARY KEY (Cno),
CONSTRAINT CompositionFK1 FOREIGN KEY (CMno) REFERENCES Musicians (Mno));

CREATE TABLE Ensembles
(Eno CHAR (4) NOT NULL,
EName VARCHAR2 (30) NOT NULL,
ECountry CHAR (4),
EMnoMgr NUMBER (8,0),
CONSTRAINT EnsemblePK       PRIMARY KEY (Eno),
CONSTRAINT EnsembleFK1 FOREIGN KEY (ECountry) REFERENCES Countries (CntryCd),
CONSTRAINT EnsembleFK2 FOREIGN KEY (EMnoMgr) REFERENCES Musicians (Mno));

CREATE TABLE Performances
(Pno NUMBER (8,0) NOT NULL,
PDate NUMBER (8,0),
PCno NUMBER (8,0),
PCity VARCHAR2 (30),
PCountry CHAR (4),
PEno CHAR (4),
CONSTRAINT PerformancePK PRIMARY KEY (Pno),
CONSTRAINT PerformanceFK1 FOREIGN KEY (PCno) REFERENCES Compositions (Cno),
CONSTRAINT PerformanceFK2 FOREIGN KEY (PCountry) REFERENCES Countries (CntryCd),
CONSTRAINT PerformanceFK3 FOREIGN KEY (PEno) REFERENCES Ensembles (Eno));

CREATE TABLE Ensemble_Members
(EmEno CHAR (4) NOT NULL,
EmMno NUMBER (8,0),
EmInstrument VARCHAR2 (30),
CONSTRAINT EMemberPK       PRIMARY KEY (EmEno, EmMno),
CONSTRAINT EMemberFK1 FOREIGN KEY (EmEno) REFERENCES Ensembles (Eno),
CONSTRAINT EMemberFK2 FOREIGN KEY (EmMno) REFERENCES Musicians (Mno));
```

2b. Insert sample data into your database tables (at least six records per table). Your data must illustrate the role of foreign keys and referential integrity. [18]

Use appropriate INSERT statements here; tables will be checked for meaningful data.

INSERT INTO Countries VALUES (&cCode, &cName);

INSERT INTO Musicians VALUES (&muNumber, &muName, &muDoB, &muCountry);

INSERT INTO Compositions VALUES (&coNumber, &coTitle, &coMusician, &coDate);

INSERT INTO Ensembles VALUES (&enNumber, &enName, &enCountry, &enManager);

INSERT INTO Performances VALUES (&prNumber, &prDate, &prComp#, &prCity, &prCountry, &prEnsemble);

INSERT INTO Compositions VALUES (&emNumber, &emMusician, &emInstrument);

3.
Write SQL statements to realize the following:

3a. Registered musicians from USA or JAM (where "USA" and "JAM" are abbreviated codes for United States and Jamaica respectively). [03]

```
SELECT Mno, Mname FROM Musicians WHERE(Mcountry = 'USA' or Mcountry = 'JAM';
```

3b. Give the ENO of every ensemble that includes a SAXAPHONE or CLARINET player. [03]

```
SELECT DISTINCT Eno FROM Ensmble_Members WHERE Instrument = 'SAXAPHONE' or Instrument =
'CLARINET';
```

3c. Give the ENO of every ensemble that includes a SAXAPHONE but not a CLARINET player. [04]

```
SELECT DISTINCT Eno FROM Emsemble_Members WHERE  Instrument = 'SAXOPHONE')  MINUS
(SELECT DISTINCT ENO FROM Ensemble_Members WHERE Instrument = 'CLARINET') ;
```

3d. List all compositions (CNO) by MOZART [04]

```
SELECT C.Cno FROM Compositions C, Musicians M WHERE C.Mno = M.Mno AND M.Mname = 'MOZART';
```

3e. List all performances (PNO CNO MNO & PCOUNTRY) of compositions in the country of origin. [06]

```
SELECT P.Pno, P.Cno, M.Mno, P.Pcountry FROM Performances P, Musicians M,
  Compositions C WHERE P.Cno = C.Cno AND C.Mno = M.Mno AND M.Mcountry = P.Pcountry;
```

3f. Give the ENO of every ensemble that includes a SAXAPHONE or CLARINET player, but not both. [06]

```
SELECT DISTINCT Eno FROM Ensemble_Members WHERE Instrument = 'SAXOPHONE' OR Instrument =
'CLARINET' MINUS
(SELECT DISTINCT Eno FROM Ensemble_Members EM1, Ensemble_Members EM2 WHERE (EM1.Eno =
EM2.Eno AND EM1.Instrument = 'SAXOPHONE' AND EM2.Instrument = 'CLARINET') OR (EM1.Eno =
EM2.Eno AND EM1.Instrument = 'CLARINET' AND EM2.Instrument = 'SAXAPHONE'));
```

3g. Find CNO for compositions which have been performed in USA. [03]

```
SELECT DISTINCT Cno FROM Performances WHERE Pcountry = 'USA';
```

3h. List countries in which MOZART's compositions have been performed. [03]

```
SELECT DISTINCT P.Pcountry FROM Performance P, Compositions C, Musicians M
 WHERE P.Cno = C.Cno AND C.Mno = M.Mno AND M.Mname = 'MOZART';
```

3i. Give ENAME of ensembles whose manager is AMERICAN, JAMAICAN, or RUSSIAN. [04]

```
SELECT E.Ename FROM Ensembles E, MUSICIANS M
  WHERE E.Mno_Mgr = M.Mno AND M.Mcountry IN ('JAM', 'USA', 'RUS');
```

4.
Define and specify SQL views to realize the above requirements (of question 3). [35]

4a. CREATE VIEW JamUSA (Mno, Mname) AS SELECT Mno, Mname FROM Musicians WHERE(Mcountry = 'USA' or Mcountry = 'JAM';

4b. CREATE VIEW SaxOrClarEnsemble (Eno) AS SELECT DISTINCT Eno FROM Ensmble_Members WHERE Instrument = 'SAXAPHONE' or Instrument = 'CLARINET';

4c. CREATE VIEW SaxNotClar (Eno) SELECT DISTINCT Eno FROM Emsemble_Members WHERE Instrument = 'SAXOPHONE') MINUS (SELECT DISTINCT ENO FROM Ensemble_Members WHERE Instrument = 'CLARINET') ;

4d. CREATE VIEW MozartWorks (Cno) AS SELECT C.Cno FROM Compositions C, Musicians M WHERE C.Mno = M.Mno AND M.Mname = 'MOZART';

4e. CREATE VIEW HomePerformances (Pno, Cno, Mno, Pcountry)
AS SELECT P.Pno, P.Cno, M.Mno, P.Pcountry FROM Performances P,
Musicians M, Compositions C WHERE P.Cno = C.Cno AND C.Mno = M.Mno AND
M.Mcountry = P.Pcountry;

4f. CREATE VIEW SaxXorClar (Eno) AS SELECT DISTINCT Eno FROM
Ensemble_Members WHERE Instrument = 'SAXOPHONE' OR Instrument =
'CLARINET' MINUS
(SELECT DISTINCT Eno FROM Ensemble_Members EM1, Ensemble_Members
EM2 WHERE (EM1.Eno = EM2.Eno AND EM1.Instrument = 'SAXOPHONE'
AND EM2.Instrument = 'CLARINET') OR (EM1.Eno = EM2.Eno AND
EM1.Instrument = 'CLARINET' AND EM2.Instrument = 'SAXOPHONE'));

4g. CREATE VIEW PerformancesInUSA AS SELECT DISTINCT Cno FROM
Performances WHERE Pcountry = 'USA';

4h. CREATE VIEW CountriesForMozart (Pcountry) AS SELECT DISTINCT P.Pcountry
FROM Performance P, Compositions C, Musicians M WHERE P.Cno = C.Cno
AND C.Mno = M.Mno AND M.Mname = 'MOZART';

4i. CREATE VIEW JamManagers (Ename) AS SELECT E.Ename FROM Ensembles
E, Musicians M WHERE E.Mno_Mgr = M.Mno AND M.Mcountry IN ('JAM', 'USA', 'RUS');