IT131-8L Project

Option 2: Global Computer Solutions (GCS) is an information technology consulting company with many offices throughout the United States. The company's success is based on its ability to maximize its resources—that is, its ability to match highly skilled employees with projects according to region. To better manage its projects, GCS has contacted you to design a database, so GCS managers can keep track of their customers, employees, projects, project schedules, assignments, and invoices.

The GCS database must support all of GCS's operations and information requirements. A basic description of the main entities follows:

- The employees of GCS must have an employee ID, a last name, a middle initial, a first name, a region, and a date of hire recorded in the system.
- Valid regions are as follows: Northwest (NW), Southwest (SW), Midwest North (MN), Midwest South (MS), Northeast (NE), and Southeast (SE).
- Each employee has many skills, and many employees have the same skill.
- Each skill has a skill ID, description, and rate of pay. Valid skills are as follows: Data Entry I, Data Entry II, Systems Analyst I, Systems Analyst II, Database Designer I, Database Designer II, Java I, Java II, C++ I, C++ II, Python I, Python II, ColdFusion I, ColdFusion II, ASP I, ASP II, Oracle DBA, MS SQL Server DBA, Network Engineer I, Network Engineer II, Web Administrator, Technical Writer, and Project Manager. Table P5.11a shows an example of the Skills Inventory.

TABLE P5.11A

SKILL	EMPLOYEE
Data Entry I	Seaton Amy; Williams Josh; Underwood Trish
Data Entry II	Williams Josh; Seaton Amy
Systems Analyst I	Craig Brett; Sewell Beth; Robbins Erin; Bush Emily; Zebras Steve
Systems Analyst II	Chandler Joseph; Burklow Shane; Robbins Erin
DB Designer I	Yarbrough Peter; Smith Mary
DB Designer II	Yarbrough Peter; Pascoe Jonathan
Java I	Kattan Chris; Ephanor Victor; Summers Anna; Ellis Maria
Java II	Kattan Chris; Ephanor Victor; Batts Melissa
C++ I	Smith Jose; Rogers Adam; Cope Leslie
C++ II	Rogers Adam; Bible Hanah
Python I	Zebras Steve; Ellis Maria
Python II	Zebras Steve; Newton Christopher
ColdFusion I	Duarte Miriam; Bush Emily
ColdFusion II	Bush Emily; Newton Christopher
ASP I	Duarte Miriam; Bush Emily
ASP II	Duarte Miriam; Newton Christopher
Oracle DBA	Smith Jose; Pascoe Jonathan
SQL Server DBA	Yarbrough Peter; Smith Jose
Network Engineer I	Bush Emily; Smith Mary
Network Engineer II	Bush Emily; Smith Mary
Web Administrator	Bush Emily; Smith Mary; Newton Christopher
Technical Writer	Kilby Surgena; Bender Larry
Project Manager	Paine Brad; Mudd Roger; Kenyon Tiffany; Connor Sean

- GCS has many customers. Each customer has a customer ID, name, phone number, and region.
- GCS works by projects. A project is based on a contract between the customer and GCS to design, develop, and implement a computerized solution. Each project has specific characteristics such as the project ID, the customer to which the project belongs, a brief description, a project date (the date the

contract was signed), an estimated project start date and end date, an estimated project budget, an actual start date, an actual end date, an actual cost, and one employee assigned as the manager of the project.

- The actual cost of the project is updated each Friday by adding that week's cost to the actual cost. The week's cost is computed by multiplying the hours each employee worked by the rate of pay for that skill.
- The employee who is the manager of the project must complete a project schedule, which effectively is a design and development plan. In the project schedule (or plan), the manager must determine the tasks that will be performed to take the project from beginning to end. Each task has a task ID, a brief task description, starting and ending dates, the types of skills needed, and the number of employees (with the required skills) needed to complete the task. General tasks are the initial interview, database and system design, implementation, coding, testing, and final evaluation and sign-off. For example, GCS might have the project schedule shown in Table P5.11b.

TABLE P5.11B

PROJECT ID: 1	DESCRIPTION: SALES MANAGEMENT SYSTEM			
COMPANY: SEE ROCKS	CONTRACT DATE: 2/12/2018			REGION: NW
START DATE: 3/1/2018	END DATE: 7/1/2018			BUDGET: $15,500
START DATE	END DATE	TASK DESCRIPTION	SKILL(S) REQUIRED	QUANTITY REQUIRED
3/1/18	3/6/18	Initial interview	Project Manager Systems Analyst II DB Designer I	1 1 1
3/11/18	3/15/18	Database design	DB Designer I	1
3/11/18	4/12/18	System design	Systems Analyst II Systems Analyst I	1 2
3/18/18	3/22/18	Database implementation	Oracle DBA	1
3/25/18	5/20/18	System coding and testing	Java I Java II Oracle DBA	2 1 1
3/25/18	6/7/18	System documentation	Technical Writer	1
6/10/18	6/14/18	Final evaluation	Project Manager Systems Analyst II DB Designer I Java II	1 1 1 1
6/17/18	6/21/18	On-site system online and data loading	Project Manager Systems Analyst II DB Designer I Java II	1 1 1 1
7/1/18	7/1/18	Sign-off	Project Manager	1

- GCS pools all of its employees by region; from this pool, employees are assigned to a specific task scheduled by the project manager. For example, in the first project's schedule, you know that a Systems Analyst II, Database Designer I, and Project Manager are needed for the period from 3/1/18 to 3/6/18. The project manager is assigned when the project is created and remains for the duration of the project. Using that information, GCS searches the employees who are located in the same region as the customer, matches the skills required, and assigns the employees to the project task.
- Each project schedule task can have many employees assigned to it, and a given employee can work on multiple project tasks. However, an employee can work on only one project task at a time. For example, if an employee is already assigned to work on a project task from 2/20/18 to 3/3/18, the employee cannot work on another task until the current assignment is closed (ends). The date that an

assignment is closed does not necessarily match the ending date of the project schedule task because a task can be completed ahead of or behind schedule.

- Given all of the preceding information, you can see that the assignment associates an employee with a project task, using the project schedule. Therefore, to keep track of the assignment, you require at least the following information: assignment ID, employee, project schedule task, assignment start date, and assignment end date. The end date could be any date, as some projects run ahead of or behind schedule. Table P5.11c shows a sample assignment form.

TABLE P5.11C

PROJECT ID: 1		DESCRIPTION: SALES MANAGEMENT SYSTEM				
COMPANY: SEE ROCKS		CONTRACT DATE: 2/12/2018		AS OF: 03/29/18		
SCHEDULED				ACTUAL ASSIGNMENTS		
PROJECT TASK	START DATE	END DATE	SKILL	EMPLOYEE	START DATE	END DATE
Initial interview	3/1/18	3/6/18	Project Mgr. Sys. Analyst II DB Designer I	101-Connor S. 102-Burklow S. 103-Smith M.	3/1/18 3/1/18 3/1/18	3/6/18 3/6/18 3/6/18
Database design	3/11/18	3/15/18	DB Designer I	104-Smith M.	3/11/18	3/14/18
System design	3/11/18	4/12/18	Sys. Analyst II Sys. Analyst I Sys. Analyst I	105-Burklow S. 106-Bush E. 107-Zebras S.	3/11/18 3/11/18 3/11/18	
Database implementation	3/18/18	3/22/18	Oracle DBA	108-Smith J.	3/15/18	3/19/18
System coding and testing	3/25/18	5/20/18	Java I Java I Java II Oracle DBA	109-Summers A. 110-Ellis M. 111-Ephanor V. 112-Smith J.	3/21/18 3/21/18 3/21/18 3/21/18	
System documentation	3/25/18	6/7/18	Tech. Writer	113-Kilby S.	3/25/18	
Final evaluation	6/10/18	6/14/18	Project Mgr. Sys. Analyst II DB Designer I Java II			
On-site system online and data loading	6/17/18	6/21/18	Project Mgr. Sys. Analyst II DB Designer I Java II			
Sign-off	7/1/18	7/1/18	Project Mgr.			

(Note: The assignment number is shown as a prefix of the employee name—for example, 101 or 102.) Assume that the assignments shown previously are the only ones as of the date of this design. The assignment number can be any number that matches your database design.

- Employee work hours are kept in a work log, which contains a record of the actual hours worked by employees on a given assignment. The work log is a form that the employee fills out at the end of each week (Friday) or at the end of each month. The form contains the date, which is either the current Friday of the month or the last workday of the month if it does not fall on a Friday. The form also contains the assignment ID, the total hours worked either that week or up to the end of the month, and the bill number to which the work-log entry is charged. Obviously, each worklog entry can be related to only one bill. A sample list of the current work-log entries for the first sample project is shown in Table P5.11d.

TABLE P5.11D

EMPLOYEE NAME	WEEK ENDING	ASSIGNMENT NUMBER	HOURS WORKED	BILL NUMBER
Burklow S.	3/1/18	1-102	4	xxx
Connor S.	3/1/18	1-101	4	xxx
Smith M.	3/1/18	1-103	4	xxx
Burklow S.	3/8/18	1-102	24	xxx
Connor S.	3/8/18	1-101	24	xxx
Smith M.	3/8/18	1-103	24	xxx
Burklow S.	3/15/18	1-105	40	xxx
Bush E.	3/15/18	1-106	40	xxx
Smith J.	3/15/18	1-108	6	xxx
Smith M.	3/15/18	1-104	32	xxx
Zebras S.	3/15/18	1-107	35	xxx
Burklow S.	3/22/18	1-105	40	
Bush E.	3/22/18	1-106	40	
Ellis M.	3/22/18	1-110	12	
Ephanor V.	3/22/18	1-111	12	
Smith J.	3/22/18	1-108	12	
Smith J.	3/22/18	1-112	12	
Summers A.	3/22/18	1-109	12	
Zebras S.	3/22/18	1-107	35	
Burklow S.	3/29/18	1-105	40	
Bush E.	3/29/18	1-106	40	
Ellis M.	3/29/18	1-110	35	
Ephanor V.	3/29/18	1-111	35	
Kilby S.	3/29/18	1-113	40	
Smith J.	3/29/18	1-112	35	
Summers A.	3/29/18	1-109	35	
Zebras S.	3/29/18	1-107	35	

Note: xxx represents the bill ID. Use the one that matches the bill number in your database.

- Finally, every 15 days, a bill is written and sent to the customer for the total hours worked on the project during that period. When GCS generates a bill, it uses the bill number to update the work-log entries that are part of the bill. In summary, a bill can refer to many work-log entries, and each work-log entry can be related to only one bill. GCS sent one bill on 3/15/18 for the first project (SEE ROCKS), totaling the hours worked between 3/1/18 and 3/15/18. Therefore, you can safely assume that there is only one bill in this table and that the bill covers the work-log entries shown in the preceding form.

- Your assignment is to create a database that fulfills the operations described in the problem. The minimum required entities are employee, skill, customer, region, project, project schedule, assignment, work log, and bill. (There are additional required entities that are not listed.)