

ITI Examination System

Graduation Project

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Abstract:

The ITI Examination System is a culmination of a graduation project meticulously crafted to streamline the examination process for students enrolled in a diverse range of courses at the esteemed Information Technology Institute (ITI). Within this system, an array of vital entities including students, courses, tracks, and instructors collaboratively harmonize to deliver a seamless and effective experience for each student. The fundamental objective of this project is to devise a design for the ITI Examination System that intricately caters to the unique needs of students and the precise requisites of their respective courses.

This system empowers students to engage in examinations pertinent to the courses they are enrolled in, while affording instructors the authority to craft and oversee these examinations. A pivotal feature of the ITI Examination System lies in its automated capacity to generate bespoke exam questions tailored for each course. Grounded in the specific learning outcomes and objectives of every course, the system produces distinct exam questions tailored to individual students.

In summation, the ITI Examination System emerges as a holistic and sophisticated solution engineered to navigate the intricacies of examination management within a dynamic educational landscape. By endowing students with a dependable and efficient platform for examination endeavors, this system stands poised to revolutionize the examination process at ITI.

Introduction:

The ITI Examination System stands as a culmination of a rigorous graduation project, traversing through multiple pivotal phases from meticulous analysis and design to the ultimate implementation. This project's core objective was to establish a robust framework for creating examinations and formulating questions tailored for students. It encompassed a spectrum of critical stages, encompassing ERD diagram development, database design and deployment, implementation of stored procedures, SSRS reporting, and the integration of Power BI dashboards.

The genesis of this endeavor initiated with a comprehensive analysis phase, where the prerequisites and requisites of the system were meticulously discerned. This phase also encompassed the delineation of entities and the intricate relationships interconnecting them.

Subsequently, the database design phase took center stage, characterized by the inception of an ERD diagram. This graphical representation provided an invaluable visual blueprint of the system's architecture. It not only aided in the identification of imperative database tables but also facilitated the seamless transition from ERD to an operational database schema. This schema encompassed pivotal tables catering to students, courses, tracks, instructors, and a repository of exam questions, among other crucial components.

The implementation phase witnessed the actualization of the database using the SQL Server Management Studio (SSMS). It also involved the creation of indispensable stored procedures, instrumental in the manipulation and retrieval of data. Furthermore, this phase encompassed the development of SSRS reports, empowering both instructors and students to peruse and dissect exam results and other pertinent data.

The crowning achievement of the project culminated in the creation of Power BI dashboards, offering an intuitive and visually compelling representation of the data repository within the system. These dashboards not only facilitated rapid and facile data visualization but also proffered invaluable insights for potential enhancements and refinements.

In summation, the ITI Examination System, traversing a comprehensive journey of analysis, design, and implementation, emerges as a holistic solution poised to revolutionize the examination process within an educational milieu.

Scenario

The ITI Examination System is a comprehensive platform overseeing various aspects of ITI's educational programs. This system is deployed across multiple branches, each distinguished by a unique ID and a distinct name. Within every branch, a dedicated manager takes charge, is identified by a unique ID, and provides essential details including their name, gender, salary, age, hiring date.

Tracks are an integral part of the educational framework, available in one or more branches. Each track possesses a unique ID, alongside a name. Courses, the building blocks of education, are hosted within tracks, with the flexibility to exist in multiple tracks simultaneously. Each course is characterized by its own unique ID, name, and duration.

Instructors play a pivotal role in the educational process, responsible for imparting knowledge. They are associated with one or more courses, and a course may have multiple instructors. Instructors have their own unique ID, and their profiles encompass additional details like name, gender, city, salary, age, phone, and hiring date.

Topics provide a structured approach to the curriculum. A course has many topics, and topics linked with the course. Each topic boasts a unique ID and a name. Exams are the means through which courses are evaluated. They are assigned a unique ID and feature details such as the exam's full mark, duration, and the number of questions.

Questions form the core of assessments, featuring a unique ID, title, type, question level, correct answer, and choices. Student answers are meticulously recorded for each question in an exam, facilitating a thorough evaluation process.

The system manages an extensive database of students, each with a unique ID and a comprehensive profile including their first name, last name, gender, faculty, phone, graduation year, city, and moreover, students are provided with access to social media platforms, each linked to their respective social IDs, profile photos, and web links. This feature enhances connectivity and enables students to establish their professional online presence. Students enroll in a specific track and may engage in various activities such as freelancing jobs, obtaining certificates, and hiring in companies.

Freelancing jobs offer students a platform to gain practical experience. Each job is uniquely identified and encompasses details such as title, cost, start date, end date, and platform. Certificates, a testament to a student's accomplishments, are granted upon meeting specific criteria. Each certificate features a certificate verification, name, platform, and duration.

As an integral part of their educational journey, select students will have the opportunity to secure positions within various companies. These positions will encompass distinct job titles, offering students a chance to apply their acquired skills in real-world settings. Each position will come with an associated salary, reflecting the recognition of their contributions. Additionally, the hiring process will be marked by a specific date, signifying the commencement of their professional journey.

This comprehensive system streamlines ITI's educational offerings across branches, ensuring a seamless experience for students, instructors, and administrators alike. The platform covers a wide array of functionalities, ranging from course management to exam evaluations, providing a holistic educational experience.

Entities

- Tracks
- Branches
- ❖ Intake
- Courses
- **❖** Topics
- Questions
- Exam
- Students
- Instructors
- **❖** Login
- Freelance
- Certificates
- ❖ Social Media
- Hiring

Entity Relationship Diagram (ERD): Branch-Location Branch-id (First Name) Faculty Grad-Year City <u>Track ID</u> Duration ST ID Cert_Name Gender Assign cert-verification Intake ID Intake end date Works in Salary Intake Start Date Hiring_Date inst ID Company Name Employees Gender Hiring_Date first-name (Hiring ID) City Phone Job-Title <u>User-id</u> Social photo Social-Name Social-Link Social-id Freelance ID Enroll Finish Job-Title Course ID Cost Duration End_Date Start_Date Platform Duration Question_ID) Exam_Full Mark) St_Ans Stud_grade Question_Type Question-title Choices Exam ID Quest_Num Date Model_Answer

Mapping

Student (<u>St-id</u> → PK, city, fname, lname, gender, faculty, phone, age)

Track ($\underline{\text{track-id}} \rightarrow PK$, $\underline{\text{track-name,instid}} \rightarrow fk$)

Branch(Branch-id→PK,Branch-Location)

Instructors(<u>inst-id→PK</u>,first-name,last-name,gender,salary,phone,age,city,Hiring-date)

Inst-Track ($(inst-id \rightarrow fk, Track-id \rightarrow fk) \rightarrow pk)$

course(course-id,course-name,Duration)

Inst-Course($(inst-id \rightarrow fk, course-id \rightarrow fk)pk$)

Std-Course ($(Std-id \rightarrow fk, course-id \rightarrow fk)pk$)

Topic ($\underline{\text{Topic-id}} \rightarrow PK$, $\underline{\text{Topic-name, course-id}} fk$)

Exam (Exam-id→PK, Duration, Exam-Full Mark, Question-Num, course-id→fk)

Question (Question -id \rightarrow PK, Question-title , Question -Type, Model-Answer

,Question -Level,course-id \rightarrow fk)

Question-Choices ((Choices, Question-id \rightarrow fk) \rightarrow pk)

Intake (Intake-num→PK,,intake-start,intake-end)

St-intake(($\underline{\text{st-id}} \rightarrow \text{fk,intake-num} \rightarrow \text{fk}) \rightarrow \underline{\text{pk}}$)

St-Login ((user id,st-id \rightarrow fk) \rightarrow pk,password,Username)

Certification ((cert-verification,st-id \rightarrow fk) \rightarrow pk),cert-name,duration,Platform)

Hiring ((hiring-id,st-id \rightarrow fk) \rightarrow pk),company-name,hiring-date,job-title)

Social-Media ((Social-id,st-id \rightarrow fk) \rightarrow pk,Social-Photo,Social-Name,Social-Link)

Freelancing (($\underline{\text{freelance-id}},\underline{\text{st-id}} \rightarrow \underline{\text{fk}}$) $\rightarrow \underline{\text{pk}}$,job-title,platform,start_date,End_date,cost)

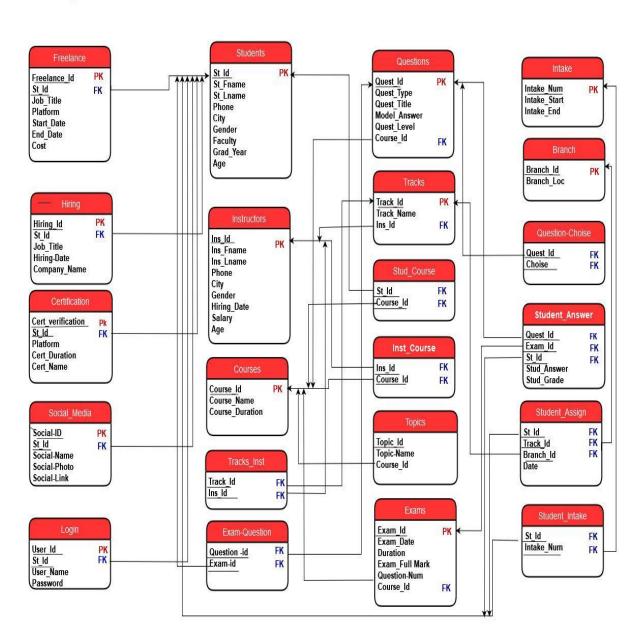
Std-Answer ((Std-id \rightarrow fk,Exam-id \rightarrow fk,Question-id \rightarrow fk) \rightarrow pk),St-ans,St_Grad,date)

Std-Assign ((St-id \rightarrow fk,track-id \rightarrow fk,Branch-id \rightarrow fk) \rightarrow pk),Date)

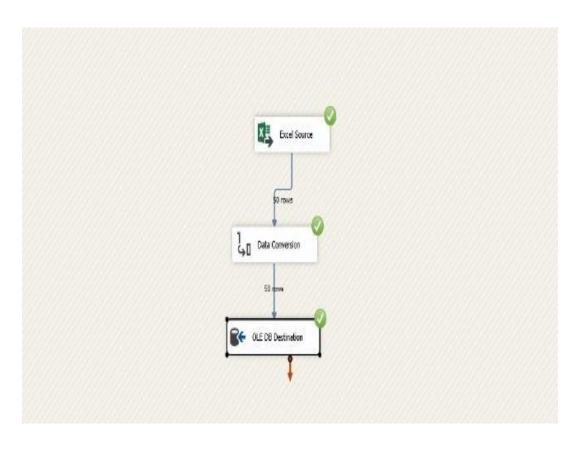
Exam-Question(Question -id, \rightarrow fk,,Exam-id \rightarrow fk) \rightarrow pk)

ERD

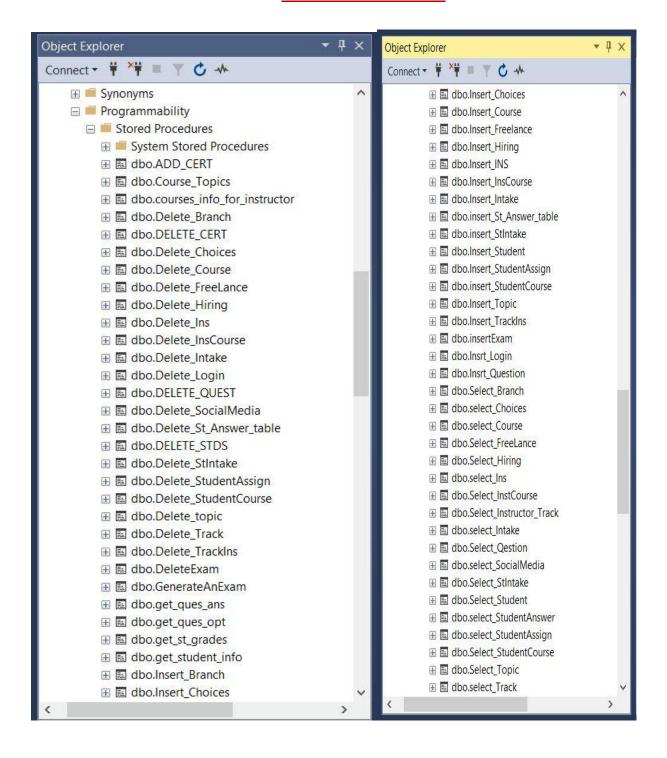




SQL Server Integration Service (SSIS)



Stored Procedures



Insert, Update, Delete, and Select For any table

EX:Upadte Track

```
USE [Examination_System]
 SET ANSI_NULLS ON
 SET QUOTED_IDENTIFIER ON
□ALTER PROCEDURE [dbo].[Update_Track]
    @Track_Id INT,
    @Track_Name VARCHAR(50),
   @Ins_Id INT
BEGIN TRY
  UPDATE Tracks
   SET
       Track_Name = @Track_Name,
       Ins_Id = @Ins_Id
   WHERE Track_Id =@Track_Id;
 END TRY
 BEGIN CATCH
   SELECT ERROR_MESSAGE() AS Errors;
 END CATCH;
```

Select Track

Delete Track

Insert Track

```
USE [Examination_System]
 SET ANSI_NULLS ON
 SET QUOTED_IDENTIFIER ON
□ALTER PROC [dbo].[Insert_Track]
 @T_NAME VARCHAR(50),
 @INS_ID INT
 AS
BEGIN
BEGIN TRY
 INSERT INTO Tracks VALUES(@T_NAME,@INS_ID)
 END TRY
 BEGIN CATCH
 SELECT 'ERROR'
 END CATCH
 END
```

Main Stored Procedures

```
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   Alter PROCEDURE GenerateAnExam
       @Exam_id INT,
       @Crs_ID INT,
       @Ex_Duration INT,
       @Exam_Fullmark int ,
       @Exam_Questionnum int ,
       @Num_TF_Questions INT,
       @Num_MCQ_Questions INT
   AS.
   BEGIN TRY
      IF NOT EXISTS (SELECT * FROM Courses WHERE Course_Id = @Crs_ID)
               SELECT 'The course does not exist' AS 'ErrMessage'
           END
       ELSE
                -- Generate a random exam with 10 questions
                      INSERT INTO Exams(Exam_id, Exam_Duration,Exam_FullMark,Question_Num, Course_Id)
               VALUES (@Exam_id, @Ex_Duration,@Exam_Fullmark,@Exam_Questionnum, @Crs_ID);
                -- Select True/False questions related to the same course
               INSERT INTO Exam_Question(Exam_id, Quest_id)
SELECT TOP (@Num_TF_Questions) @Exam_id, Q.Quest_Id
                FROM Questions Q
               WHERE Q.Course_Id = @Crs_ID AND Q.Quest_Type = 't&f'
               ORDER BY NEWID();
                -- Select Multiple Choice questions related to the same course
                INSERT INTO Exam_Question(Exam_id, Quest_id)
                SELECT TOP (@Num_MCQ_Questions) @Exam_id, Q.Quest_Id
               FROM Questions Q , Question_Choise qc
WHERE Q.Course_Id = @Crs_ID AND Q.Quest_Type = 'mcq'
               ORDER BY NEWID();
                -- Select exam model
              SELECT q.Quest_id , Quest_Title, Choices
               FROM Exam_Question eq, Questions Q, Exams E ,Question_Choise qc
               WHERE eq.Exam_Id = E.Exam_Id AND eq.Quest_id = Q.Quest_Id AND eq.Exam_Id = @Exam_id
               and qc.Quest_Id = q.Quest_Id
           END
   END TRY
   BEGIN CATCH
       SELECT ERROR_MESSAGE() AS errorMessage
  \label{eq:GenerateAnExam @Exam_id = 2 , @Crs_ID = 2 , @Exam_Fullmark = 100, @Ex_Duration = 10 , @Exam_Question num = 10 , @Num_TF_Questions = 5, @Num_MCQ_Questions = 5 \\
C 0/ -
```

```
alter PROCEDURE StudentExam_Answers
    @exam_id INT,
    @Std_ID INT,
    @Quest_Id varchar(150),
    @Std Ans Varchar(200)
AS
BEGIN TRY
    IF NOT EXISTS (SELECT * FROM Exams WHERE Exam_Id = @exam_id)
            SELECT 'The exam does not exist' AS 'ErrMessage'
       END
    ELSE IF NOT EXISTS (SELECT * FROM Questions WHERE Quest_Id = @Quest_Id)
        BEGIN
            SELECT 'The question does not exist' AS 'ErrMessage'
        END
    ELSE IF NOT EXISTS (SELECT * FROM Students WHERE St_Id = @Std_ID)
            SELECT 'The student does not exist' AS 'ErrMessage'
        END
    ELSE
        BEGIN
            INSERT INTO Student_Answer(St_Id, Exam_Id, Quest_Id,Date, Stud_Answer)
            VALUES (@Std_ID, @exam_id,@Quest_Id,GETDATE(), @Std_Ans);
END TRY
BEGIN CATCH
   SELECT ERROR_MESSAGE() AS ErrorMessage
END CATCH
```

```
create PROCEDURE StudentModelAnswertest
   @Std_ID INT,
   @Ex_No INT
AS
BEGIN TRY
   IF NOT EXISTS (SELECT * FROM Exams WHERE Exam Id = @Ex_No)
            SELECT 'The exam does not exist' AS 'ErrMessage'
        END
    ELSE IF NOT EXISTS (SELECT * FROM Students WHERE St_Id = @Std_ID)
            SELECT 'The student does not exist' AS 'ErrMessage'
        END
    ELSE
        BEGIN
            -- Update Std_Score based on the student's answers
           UPDATE SE
           SET Stud Grade = CASE WHEN q. Model Answer = Stud Answer THEN 1 ELSE 0 END
           FROM Student_Answer SE
            INNER JOIN Questions q ON SE.Quest_Id = q.Quest_Id
           WHERE SE.Exam_Id = @Ex_No AND SE.St_Id = @Std_ID
            -- Calculate the total number of correct answers
            DECLARE @TotalCorrectAnswers INT;
            SELECT @TotalCorrectAnswers = SUM(Stud Grade)
            FROM Student Answer
            WHERE Exam_Id = @Ex_No AND St_Id = @Std_ID;
            -- Calculate the grade in percentage
            DECLARE @GradePercentage DECIMAL(5, 1);
            SELECT @GradePercentage = (@TotalCorrectAnswers * 100.0) / COUNT(Quest_Id)
            FROM Student_Answer
           WHERE Exam_Id = @Ex_No AND St_Id = @Std_ID
            -- Return the grade percentage
            SELECT @GradePercentage AS GradePercentage;
        END
END TRY
BEGIN CATCH
   SELECT ERROR_MESSAGE() AS errorMessage
END CATCH
-- Test --
StudentModelAnswertest @Ex_No = 1, @Std_ID = 13
```

Reports Stored Procedures

Report1

```
USE [Examination_System]
 SET ANSI_NULLS ON
 SET QUOTED_IDENTIFIER ON

☐ ALTER PROCEDURE [dbo].[get_student_info]

   @tr_id INT
 AS
BEGIN
    BEGIN TRY
      SELECT *
       FROM Students
       WHERE St_Id IN (
          SELECT St_Id
          FROM Student_Assign
          WHERE track_id = @tr_id
       );
    END TRY
    BEGIN CATCH
       SELECT 'Check Your Values' AS ErrorMessage;
    END CATCH;
END;
```

```
USE [Examination_System]
GO
/******* Object: StoredProcedure [dbo].[get_st_grades] Script Date: 10/21/2023 4:00:15 AM ******/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER O
```

Report3

```
SET ANSI_NULLS ON
SET QUOTED_IDENTIFIER ON
GO
ALTER PROC [dbo].[courses_info_for_instructor]
@Ins_Id BIGINT
AS
BEGIN
     BEGIN TRY

IF EXISTS (SELECT * FROM Instructors i WHERE i.Ins_Id = @Ins_Id)
          BEGIN
                     Ins_Fname + ' ' + Ins_Lname as 'Instructor' ,
                    c.Course_Name as [Course Name],
COUNT(sc.St_Id) AS 'Number of students'
               FROM
                    INNER JOIN Inst_Course ic ON c.Course_Id = ic.Course_Id AND ic.Ins_Id = @Ins_Id INNER JOIN Student_Course sc ON c.Course_Id = sc.Course_Id INNER JOIN Instructors i on i.Ins_Id = ic.Ins_Id
               GROUP BY
                    c.Course_Name , Ins_Fname , Ins_Lname
          END
          BEGIN
               SELECT 'This instructor does not exist' as Error
          END
     END TRY
     BEGIN CATCH
SELECT 'An error occurred while processing the request' as Error
     END CATCH
END
```

```
USE [Examination_System]
 SET ANSI_NULLS ON
 GO
 SET QUOTED_IDENTIFIER ON
□ALTER PROCEDURE [dbo].[Course_Topics] (@CrId INT)
 AS
BEGIN
    DECLARE @Course_Name VARCHAR(50)
    SELECT @Course_Name = Course_Name
    FROM Courses
    WHERE Course_Id = @CrId
    IF @Course_Name IS NOT NULL
    BEGIN
       SELECT @Course_Name AS [Course Name], Topic_Name AS [Topic Name]
       FROM Topics
       WHERE Course_Id = @CrId
    END
    ELSE
    BEGIN
       SELECT 'This course is not found' AS Error
    END
END
```

Report5

```
SQLQuery32.sql -...U5UUHQ\Magic (67)) 😕 🗡 SQLQuery31.sql -...U5UUHQ\Magic (53)) SQLQuery26.sql -...U5UUHQ\Magic (66))*
    USE [Examination_System]
    SET ANSI_NULLS ON
    SET QUOTED_IDENTIFIER ON
    GO
  PROCEDURE [dbo].[get_ques_opt]
       @ex id INT
   BEGIN
         Try to select all questions and their options for the specified exam, with the choices aggregated into a single string.
           SELECT
              DISTINCT Q.Quest_Title,
              STRING_AGG(QC.Choices,char(10)) AS Choices
           FROM
              Questions Q
           INNER JOIN
              Question_Choise QC ON Q.Quest_Id = QC.Quest_Id
           INNER JOIN
              Student_Answer SA ON Q.Quest_Id = SA.Quest_Id
              Exams ON SA.Exam_Id = Exams.Exam_Id
           WHERE
              Exams.Exam_Id = @ex_id
           GROUP BY
           Q.Quest_Title
ORDER BY
       Q.Quest_Title;
END TRY
       BEGIN CATCH
           SELECT 'Check Your Values';
       END CATCH;
    END:
```

```
USE [Examination_System]
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
ALTER PROCEDURE [dbo].[get_ques_ans]
   @ex_id INT,
   @st_id INT
AS
BEGIN
   BEGIN TRY
      SELECT
          DISTINCT Q.Quest_Title,
          STRING_AGG(QC.Choices, char(10)) AS Choices,
          SA.Stud_Answer
      FROM
          Questions Q
      INNER JOIN
          Question_Choise QC ON Q.Quest_Id = QC.Quest_Id
          Student_Answer SA ON Q.Quest_Id = SA.Quest_Id
      INNER JOIN
          Exams ON SA.Exam_Id = Exams.Exam_Id
      WHERE
          SA.Exam_Id = @ex_id AND
          SA.St_Id = @st_id
      GROUP BY
          Q.Quest Title,
          SA.Stud_Answer
      ORDER BY
          Q.Quest_Title;
   BEGIN CATCH
```

SQL Server Reporting Service (SSRS)

Students Information by Track

Phone	Faculty	Grad_Year	Age
1148572510	FacultyofComputerandInformatics	2021	24
1006542728	Commerce	2019	27
1116651109	ComputerScience	2022	27
1116111102	DataSciene	2022	26
1151101220	ComputerofScience	2022	23
1055589154	Engineering	2022	24
1055563612	Engineering	2021	25
1055589791	Engineering	2022	24
1055579137	computerscience	2023	23
1055539989	computerscience	2023	23
1155518013	DataSciene	2018	27
1055569045	computerscience	2019	26
1055565718	computerscience	2023	23
1255589512	FacultyofComputerandInformatics	2021	25
1255578729	computerscience	2019	26
1255510779	FacultyofComputerandInformatics	2019	26
1255507442	computerscience	2018	27
1055566590	Engineering	2019	26
1055545621	computerscience	2022	24
1155505219	Engineering	2023	23
1055598130	FacultyofComputerandInformatics	2023	23
1255503595	computerscience	2018	27
1055579621	computerscience	2019	26



Courses by Instructors

Instructor	Course Name
Ramy Mohamed	DataMining
Ramy Mohamed	XML



	Topic Name
	XML Syntax
EI	ements and Attributes
	XML Declaration
Well-I	Formed XML vs. Valid XML
	XML Schema (XSD)

Students Grade

Course Name	Grade
XML	90

Question Num	Question Title	Choices
1	Business intelligence equips enterprises to gain business advantage from data	A) True B) False
2	BI helps in identifying and understanding the relationship between business processes and performance?	a) True b) False
3	Big Data refers to the storage of data in traditional relational databases?	a) True b) False



Quest Title	Choices	Stud Answer	
	A) True B) False	True	
BI helps in identifying and understanding the relationship between business processes and performance?	a) True b) False	True	
Big Data refers to the storage of data in traditional relational databases?	a) True b) False	False	
Business intelligence (BI) is a broad category of application programs which includes ?	A) Decision support B) Data Mining C) OLAP D) All of the above	All of the above	
Classification is	a) A subdivision of a set of examples into a number of classes b) A measure of the accuracy, of the classification of a concept that is given by a certain theory c) The task of assigning a classification to a set of examples d) None of these	The task of assigning a classification to a set of examples	
Data Mining can only be performed using specialized software and tools	a) True b) Flase	True	
Data warehouse architecture is based on	a) RDBMS b) Sybase c) SQL Server d) DBMS	DBMS	
KPI stands for?	A) Key Performance Indicators B) Key Performance Identifer C) Key Processes Identifer D) Key Processes Indicators	Key Performance Indicators	
MapReduce can best be described as a programming model used to develop Hadoop-based applications that can process massive amounts of data.	a) True b) False	False	
Reports use Data Management to retrieve data for a report when a query runs or when the report is processed.	a) True B) False	False	

Power BI Dashboards



