**BTEC Assignment Brief**

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| **Qualification** | Pearson BTEC Higher Nationals in Digital Technologies |
| **Unit number and title** | Unit 10 Database Design and Development |
| **Learning aim(s)** | By the end of this unit, students will be able to:  **LO1** Use an appropriate design tool to design a relational database system for a substantial problem.  **LO2** Develop a fully functional relational database system, based on an existing system design.  **LO3** Test the system against user and system requirements.  **LO4** Produce technical and user documentation. |
| **Assignment title** | HVAC Data Model |
| **Assessor** | Abul Ala Nauman |
| **Issue date** | December 02, 2024 |
| **Hand in deadline** |  |

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| **Scenario or Context** | **Assignment Title: HVAC Data Model**  **Scenario:**  TechnoHVAC is a fictitious industrial HVAC solutions provider based in Uzbekistan. You have been contacted to design and implement a database for TechnoHVAC that meets the data requirements. These necessities are defined in this scenario and below are samples of the paper records that the TechnoHVAC uses. TechnoHVAC is focused in providing Air conditioners, Heat pumps, Furnace, Air handlers, Ductwork, Humidifiers / Dehumidifiers, Thermostats, Boilers, Geothermal heat pumps etc., at industrial customers. Customers can request several installations, but each installation is tailor-made for a specific industrial need. Facilities are classified by type. One or more employees are assigned to each facility. Because these facilities are often very large, they can include carpenters, masons’ engineers as well as water installers. There can be multiple computers in a facility. Below are examples of paper records that TechnoHVAC currently maintains  **Staff Management Record**   |  |  |  | | --- | --- | --- | | Staff Number | Name | Type | | SHA1 | Alisher | Mason | | SHA8 | Abdul Aziz | Installation Engineer | | SHA2 | Ulugbek | Aquatics installer | | SHA11 | Yusuf | Installation Engineer | | SHA23 | Eric | Plumber | | SHA66 | Ardaq | Aquatics installer | | SHA55 | Asilbek | Brick Layer |   **Equipment Type Table**   |  |  | | --- | --- | | Type | Equipment | | Air handlers | Ductless | | Thermostats | Standard, Super | | Air Pumps | Standard, Super | | Filters | Air driven, Under gravel | | Humidifiers | Standard, Super | | Dehumidifiers | Standard, Super |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Installation ID | Installation Type | Installation Name and Address | Customer | Equipment | Types of Staff Required | Period of Staff assignment | | 234 | Cooling Ventilation | Tashkent | Bobur  ABC Textile | 2 x Air handlers  1 x standard thermostat | 1 x Carpenter  1 x Aquatics installer  1 x Installation Engineer | From 1st September 2023 | | 654 | Heating and cooling | Samarkand | Alice  DEF Fertilizers | 2 air pumps 2 x Humidifiers  2 x Dehumidifiers  standard thermostats | 1 x Plumber  2 x Aquatics installer  2 x Installation Engineer | 1st June 2022 – 1st June 2024 | | 767 | Geo Thermal Heating | Bukhara | Dmitry  GHI Flour mills | 2 air pumps 2 x Humidifiers  2 x Dehumidifiers  standard thermostats | 1 x Plumber  2 x Aquatics installer  2 x Installation Engineer | From 30th June2023 | | 943 | Dehumidification | Nukus | Eric  JKL Autos | 2 air pumps 2 x Humidifiers  2 x Dehumidifiers | No staff required |  | | 157 | Radiant Heating | Angren | Shahzod MNO Plastics and Aluminum | 2 x Humidifiers  standard thermostats | 1 x Installation Engineer | 1st September 2021 – 1st September 2022 |   **Task 1**   * Identify the user and system requirements to design a database for the above scenario and design a relational database system using conceptual design (ER Model) by including identifiers (primary Key) of entities and cardinalities, participations of relationships. Convert the ER Model into logical database design using relational database model including primary keys foreign keys and referential Integrities. It should contain at least five interrelated tables. Check whether the provided logical design is normalized. If not, normalize the database by removing the anomalies.   **Note:** It is allowed to have your own assumptions and related attributes within the scope of the case study given   * Design set of simple interfaces to input and output for the above scenario using Mockup screens or any interface-designing tool. Evaluate the effectiveness of the given design (ERD and Logical design) in terms of the identified user and system requirements.   **Task 2**   * Develop a relational database system according to the ER diagram you have created (Use SQL DDL statements). Provide evidence of the use of a suitable IDE to create a simple interface to insert, update and delete data in the database. * Explain the usage of DML with below mentioned queries by giving at least one example per each case from the developed database. Assess the usage of the below SQL statements with the examples from the developed database to prove that the data extracted through them are meaningful and relevant to the given scenario. * Select/ Where / Update / Between / In / Group by / Order by / Having   **Task 3**   * Provide a suitable test plan to test the system against user and system requirements. Provide relevant test cases (integrity constraints) for the database you have implemented. Assess how the selected test data can be used to improve the effectiveness of testing.   **Note:** Student needs to give expected results in a tabular format and screenshots of the actual results with the conclusion   * Get independent feedback on your database solution from the non-technical users and some developers (use surveys, questioners, interviews or any other feedback collecting method) and make recommendations and suggestions for improvements in a separate conclusion / recommendations section.   **Task 4**   * Produce a technical documentation and a user guide for the developed database system. Suitable diagrams (Flow charts, ERDs and Normalized Table to 3NF) should be included in the technical documentation to show data movement in the system as well as absence of anomalies. Assess the developed database by suggesting future enhancements to ensure the effectiveness of the system. |
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Learning Outcomes and Assessment Criteria

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| **Pass** | **Merit** | **Distinction** |
| **LO1** Use an appropriate design tool to design a relational database system for a substantial problem | | **D1** Evaluate the effectiveness of the design in relation to user and system requirements. |
| **P1** Design a relational database system using appropriate design tools and techniques, containing at least four interrelated tables, with clear statements of user and system requirements. | **M1** Produce a comprehensive design for a fully functional system that includes interface and output designs, data validations and data normalization. |
| **LO2** Develop a fully functional relational database system, based on an existing system design | |  |
| **P2** Develop the database system with evidence of user interface, output, and data validations, and querying across multiple tables.  **P3** Implement a query language into the relational database system | **M2** Implement a fully functional database system that includes system security and database maintenance  **M3** Assess whether meaningful data has been extracted using query tools to produce appropriate management information. |
| **LO3** Test the systems against user and system requirements | | **LO2 & LO3**  **D2** Evaluate the effectiveness of the database solution in relation to user and system requirements, and suggest improvements. |
| **P4** Test the system against user and system requirements. | **M4** Assess the effectiveness of the testing, including an explanation of the choice of test data used. |
| **LO4** Produce technical and user documentation | | **D4** Evaluate the database in terms of improvements needed to ensure the continued effectiveness of the system. |
| **P5** Produce technical and user documentation. | **M5** Produce technical and user documentation for a fully functional system, including diagrams showing movement of data through the system, and flowcharts describing how the system works. |

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| **Sources of information to support you with this Assignment** | **Submission Requirements:**  **Task 1:**  The submission should be in the form of an individual written report written in a concise, formal business style using single spacing and font size 12. You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced using Harvard referencing system. Please also provide in-text citation and bibliography using Harvard referencing system. The recommended word limit is 3,000–3,500 words, although you will not be penalized for exceeding the total word limit.  **Task 2:**  The submission should be in the form of a fully functional relational database system demonstrated to the Teacher; and an individual written report (please see details in Task 1 above).  **Task 3:**  The submission should be in the form of a witness statement of the testing completed by the Teacher; technical documentation; and a written report (please see details in Task 1 above).  **Books:**  Churcher, C. (2012) Beginning Database Design: From Novice to Professional. 2nd Ed. Apress.  Connolly, T. and Begg, C. (2014) Database Systems: A Practical Approach to Design, Implementation and Management. 6th Ed. Global Edition. Pearson.  Kroemke, D. and Auer, D. (2012) Database Concepts: International Edition. 6th Ed. Pearson.  Paulraj, P (2008). Database Design and Development: An Essential Guide for IT Professional. Wiley.  Stephens, R. (2008) Beginning Database Design Solutions. Wrox.  **Journals:**  International Journal of Database Management Systems  Journal of Database Management  The Computer Journal  Journal of Systems Analysis and Software Engineering  Journal of Emerging Trends in Computing and Information Sciences |