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63_Development of MS EXCEL Software for Civil Engineering Applications

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APPRECIATION

This is to certify that Dr./Mr./Ms. **Arbaz Kazi** has presented / participated / contributed for a **SLP** length paper with the title **Development of MS Excel Spreadsheet for various Civil Engineering Estimation Work** in the **International Conference on Advances in Mechanical & Civil Engineering (IC-AMCE 2023)** organized during February, 24th & 25th, 2023 at **Thakur College of Engineering and Technology,** Kandivali (E), Mumbai.

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Development of MS Excel Software for Civil Engineering Problems

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***Abstract*—** As one of the fundamental engineering disciplines, civil engineering is frequently burdened with tedious work when determining the quantity of various materials to be required to complete an activity, particularly in cases of estimating and costing work. Spreadsheets have grown in popularity as a tool for tackling engineering-related issues over time. Spreadsheets' intuitive cell-based layout and user-friendly features are among their strong points. Spreadsheets' user interface is interactive, making it simple for anybody to use for day-to-day tasks. They may also be used to easily do simple to sophisticated civil engineering calculations that might otherwise take several hours of hard effort. The use of Excel spreadsheets and VBA in teaching civil engineering topics and developing practical applications is highlighted in this study. The emphasis is on Quantity Estimation and structural design concepts. For approximate estimation, cost of painting, cost of flooring, bar bending schedule for slabs, concrete mix design, and structural beam design, several spreadsheets were created. Seven illustrative examples are provided to show how spreadsheets can be an effective teaching tool for civil engineering concepts.

Keywords: Civil Engineering, Spreadsheets, Quantity Estimation, Structural Design.

I. INTRODUCTION

Civil engineering branch is one of the oldest and core branches of engineering. This field have number of design and analysis problem in its domain area. These problems are complex and time consuming, so need of software application on is must for arriving the solution for the given problem. There are some software packages available in the market with the aid of which one can find the solution for the various design problem, but the available software packages are costly and also no full access is provided during trial period. Also, most of the software packages don't provide perpetual license, which means after certain time duration one has to pay heavy amount to get back the access for the same. The security is also an issue if there rises problem in the operating system or some hardware related problem in desktop/laptop, most of this already completed files gets deleted as there is no provision for data backup in cloud.

Hence to overcome this problem we will develop software application to address some design an analysis problem in various domains of civil engineering.

II. OVERVIEW OF LITERATURE

Excel has been widely utilized in different branches of civil engineering because of its easy accessibility and the user's ability to solve complex systems without much prior knowledge of the software [1]. Huddleston [2] utilized Excel in branching pipe flow networking piping system analysis, several studies were conducted on the application of Excel in engineering hydraulics in that year. Hegazy and Ersahin [3] developed an information system for subcontractors and small to medium-sized contractors using Excel and VBA. Weiss and Gulliver [4] demonstrated how to analyse hydraulic design projects using Excel. Jewell [5] has demonstrated to undergraduate students the value of equation solver in the instruction of hydraulic design. Several spreadsheets were created by Thiriez [6] as teaching aids for pupils. One instance is animating a presentation using window switching and macros while using Excel's drawing features to show decision trees. Another illustration given by Thiriez [6] is the use of Excel in stochastic or deterministic dynamic programming, where Excel features make it easier to create specific models. Huddleston, Alarcon and Chen [7] examined how to analyse water distribution networks using Excel. Ickert and Huston [8] created a spreadsheet that can be used to assess various engineering solutions quickly and accurately, as well as to create graphs that show the solution to users. Kaarahan and Ayvaz [9] used spreadsheets for modelling groundwater that is time-dependent. Rivvas, Gomez-Acebo and Ramos [10] explored the use of spreadsheets in the teaching of hydraulic and thermal engineering for system analysis and process optimization. Grabow and mccornik [11] proposed an Excel algorithm for managing water quality and allocation. Bhattacharjya [12] shows how to determine the critical depth of an open channel using the Excel solver. Zaneldin and El-Ariss [13]employed spreadsheets in the disciplines of structural engineering and construction management. These programmes fit into the first group: Management of construction data, Time-cost tradeoff (TCT) analysis, Optimum markup estimation, Simulating and Scheduling of Construction Activities with Uncertain Durations, Scheduling of Linear and Repetitive Projects, Schedule and Cost Control, and Optimization of Construction Operations are some of the topics covered. Contributions to the latter category come from structural calculations of reactions, internal forces, stresses, strains, deflections, and slopes. Barati [14] calibrated Muskingum