

Chapter 1

Dynamic Template Generation

ABSTRACT

A test blueprint/test template, also known as the table of specifications, represents the structure of a test. It has been highly recommended in assessment textbook to carry out the preparation of a test with a test blueprint. This chapter focuses on modeling a dynamic test paper template using multi-objective optimization algorithm and makes use of the template in dynamic generation of examination test paper. Multi-objective optimization-based models are realistic models for many complex optimization problems. Modeling a dynamic test paper template, similar to many real-life problems, includes solving multiple conflicting objectives satisfying the template specifications.

TERMINOLOGY USED

The general terminology used in this chapter is briefly discussed in Table 1.

The Test paper Template (TPT) shown in Table 2 is a systematic design plan which lays out exactly how the test paper gets created.

The TPT with maximum marks (TM), distribution of unit/module weights (u_1, u_2, \dots, u_m), distribution of cognitive levels weights (l_1, l_2, \dots, l_n), etc. so suggested in the QPT Format in Table 3 above is expected to ensure that-

1. The weight given to each unit/module, (u_1, u_2, \dots, u_m) in a test paper is appropriate, so that the important modules are not neglected.

Table 1. Terminology used for dynamic template generation

Term	Meaning
Course	Course is a Degree/Diploma program offered at a university. Example: 1. Bachelor of Science (Computer Science)-B.Sc (Comp.Sc.) 2. Bachelor of Computer Application -BCA
Subject	S is a subject/paper offered in different semesters of a course. Example: Software Engineering (SE) in 6 th Semester and Information Technology (IT) in 1 st Semester of B.Sc(Comp. Sc).
Modules/ Units	For each subject, there is a prescribed syllabus having different modules/units. A set of related topics is grouped as one unit/module. Each module is allotted a particular weightage. Example: Module on Software Requirement in SE subject has weightage of 30% in the 6 th semester of B.Sc (Comp. Sc).
Educational Taxonomy	A classification system of educational objectives based on level of student understanding necessary for achievement or mastery. Example- Benjamin Bloom, Solo etc.
m, n, TM	m, n, TM are the Instructor specified number of modules, number of levels and total marks respectively for generating a dynamic QPT.
Module (p_i)	p_i is the i^{th} module specified by Instructor for QPT, $p=<p_1, \dots, p_m>$
Taxonomy Level (q_j)	q_j is the j^{th} level specified by Instructor for QPT, $q=<q_1, \dots, q_n>$
Module Weight (u_i)	u_i is the weight assigned to the i^{th} module in the QPT
Level Weight (l_j)	l_j is the weight assigned to the j^{th} level in the QPT
Module-Level- Weight (x_{ij})	x_{ij} is the weight assigned to the i^{th} module of j^{th} level in the QPT
Question Paper Template (QPT) of maximum marks TM	QPT is an $m \times n$ matrix with rows representing Modules p_i ($i= 1$ to m), columns representing Educational Taxonomy Levels q_j ($j= 1$ to n), cells representing i^{th} module of j^{th} level x_{ij} such that $\sum_{i=1}^m u_i = \sum_{j=1}^n l_j = TM$
m^*, n^*, tm	m^*, n^*, tm are the Instructor specified number of modules, number of levels and total marks respectively for generating a scaled QPT.
Scaled Module- Level-Weight (x^*_{vw})	x^*_{vw} is the scaled weight assigned to the v^{th} module of w^{th} level.
Scaled Module Weight (u^*_v)	u^*_v is the scaled weight assigned to the v^{th} module
Scaled Level Weight (l^*_w)	l^*_w is the scaled weight assigned to the w^{th} level
Scaled QPT (qpt) of maximum marks tm	qpt is an $m^* \times n^*$ matrix generated from QPT by scaling its rows with respect to m^* modules and scaling its columns with respect to n^* levels such that $\sum_{v=1}^{m^*} u^*_v = \sum_{w=1}^{n^*} l^*_w = tm$

- The weightage of cognitive skills, (l_1, l_2, \dots, l_n) tested are appropriate. For example, there are sufficient questions requiring application and understanding of logical reasoning.

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