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 brie y 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 $(u_1, u_2..., u_m)$, distribution of cognitive levels weights $(l_1, l_2..., l_n)$, etc. so suggested in the QPT Format in Table 3 above is expected to ensure that-

1. The weight given to each unit/module, $(u_1, u_2..., um)$ 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 6th Semester and Information Technology (IT) in 1st 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 6th 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 ith module specified by Instructor for QPT, $p=<p_1\ldots,p_m>$
Taxonomy Level (q_j)	q_j is the jth level specified by Instructor for QPT, $q=<q_1,\ldots,q_n>$
Module Weight (u_i)	u_i is the weight assigned to the ith module in the QPT
Level Weight (l_j)	l_j is the weight assigned to the jth level in the QPT
Module-Level-Weight (x_{ij})	x_{ij} is the weight assigned to the ith module of j^h level in the QPT
Question Paper Template (QPT) of maximum marks TM	QPT is an m×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^h 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 vth module of wth level.
Scaled Module Weight ($u`_v$)	$u`_v$ is the scaled weight assigned to the vth module
Scaled Level Weight ($l`_w$)	$l`_w$ is the scaled weight assigned to the wth level
Scaled QPT (qpt) of maximum marks tm	qpt is an m`×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 $$\sum_{v=1}^{m`} u`_v = \sum_{w=1}^{n`} l`_w = tm$$

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

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