

Modified Guidelines for Setting Good Quality Question Papers

Version 2.0



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Introduction

National education policy 2020 lays emphasis on the development of the cognitive capacities - both the 'foundational capacities' of literacy and numeracy and 'higher-order' cognitive capacities, such as critical thinking and problem solving, along with social, ethical, and emotional capacities and dispositions.

It is widely acknowledged that "assessment drives learning", that is "what and how students learn depends to a major extent on how they think they will be assessed". Thus, it is necessary that the assessment plan for each course is aligned with learning outcomes of the course and level of learning student is expected to achieve. The guidelines are framed for improving the quality of assessment and setting a good quality question paper. However, a slight modification may be required to adopt these guidelines for specific courses. Moreover, it should be noted that only written examinations may not be appropriate for the assessment of the all the outcomes and cognitive levels for a course. Other methods such as course project, minor project, major projects, capstone projects etc. are used for assessment of higher order thinking skills (Cognitive complexity as per Bloom's Taxonomy). Thus, it should be identified that which topic of the syllabus (of a course) is contributing in achieving to a particular course outcome (CO) and which level of thinking skills (L) is involved.

L₁: Remembering

L₂: Understanding

L₃: Applying

L₄: Analysing

L₅: Evaluating

L₆: Creating

Moreover, the method of assessment for each CO should be identified. Table 1 gives a method for alignment of COs with the syllabus of a course-topics ($t_1, t_2, t_3, t_4, \dots$). Note that one topic may contribute to more than one CO. Further, the weightage of each course outcome (CO) for assessment through written exams should be assigned by course coordinator/subject expert, and should be approved by Board of Studies (BOS) of respective department.

NOTE: In general, the overall weightage of a CO (desired) W_{CO_d} for written examinations should be in proportion to CO-PO correlation (PO: Program Outcome) by considering only those COs which are related to written examination. That is weightage of a CO in the written examination should be in proportion to whether it has High (3), Moderate (2), or Low (1) correlation with POs. However, there may be deviation in the weightage as the assessment of a CO may involve other methods of assessment along with written examination.

Table 1: CO-Syllabus alignment

Course Outcomes (COs)	Topics (Contributing to achieve a CO)	Method of Assessment	Level of thinking skills	Overall weightage for written exams (Desired) : W_{CO_d}
CO1	$t_1, t_2, t_6, t_9, \dots$	Written Exam, Projects	L ₂ , L ₃ , L ₆	$W_{CO1_d} = 15\%$
CO2	$t_2, t_3, t_4, t_{11}, \dots$	Written Exams	L ₂ , L ₃ , L ₄	$W_{CO2_d} = 25\%$
CO3	$t_4, t_5, t_6, t_{20}, \dots$	Projects	L ₅ , L ₆	$W_{CO3_d} = 0\%$
CO4	$t_1, t_{17}, t_{19}, \dots$	Written Exams	L ₃ , L ₄	$W_{CO_d} = 30\%$
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Note that values in the above table are just for demonstration. Actual values shall be assigned by course coordinator and approved by BOS. Moreover, overall weightages of CO in written exams will be different for Quizzes, Mid Semester, and End Semester Examinations.

- The question paper shall clearly **indicate associated CO and Level of thinking skills (L)** against each question (sub-part of the question) along with marks. Questions in a paper should be properly aligned to COs (related to written examination) e.g. Question 1. Design a circuit of full adder using two half adders (CO2, L3).
- The question paper shall be evaluated on the basis of coverage of syllabus, level of difficulty, level of thinking skills, alignment of questions with COs, and choice in attempt.

The crux of these guidelines is given in the following Table.

Table 2: Criterion for TES calculation

S. No.	Criterion	Weightage	Score*	Weighted Score
1.	Coverage of Syllabus	0.2	A	0.2 x A
2.	Level of difficulty	0.3	B	0.3 x B
3.	Level of thinking skills	0.2	C	0.2 x C
4.	Alignment of questions with COs	0.2	D	0.2 x D
5.	Choice in Attempt	0.1	E	0.1 x E
			TOTAL	TES

The total evaluation score (TES) shall be calculated using the following formula:

$$TES = 0.2 \times A + 0.3 \times B + 0.2 \times C + 0.2 \times D + 0.1 \times E$$

An adherence index (AI) of the question paper is computed that indicates adherence to guidelines. The AI is given as:

$$AI = 1 - \left(\frac{TES}{Max. Marks (M)} \right)$$

*Note: To compute score of a question paper, use data sheet given in the following section.

1. **Coverage of Syllabus (A):** 35%-40% of the entire syllabus (Syllabus-I) should be completed till Mid Term Examination, and remaining 60-65% of the entire syllabus (Syllabus-II) should be completed before the last of teaching.
 - a. Question paper of the Mid Semester Examination should be uniformly distributed over the Syllabus-I.
 - b. Question paper of the End Semester Examination should carry 20-25% weightage from Syllabus-I and 75-80% weightage from Syllabus-II. For example, a question paper of total marks 50, should carry 10 marks questions from Syllabus-I and 40 marks questions from Syllabus-II.

NOTE:

In general, the contacts hours prescribed in a syllabus for different Units are unequal. Thus, to arrive at the **desired allocation** of marks for different Units of the syllabus, the weightages for each Unit shall be calculated using marks per contact hours (α). Marks per contact hour would be different for Syllabus-I and Syllabus-II. The same is illustrated below.

Table 3: Marks per contact hour

S. No.	Syllabus	Contact Hours	Marks	Marks per Contact hour
1.	Syllabus-I	0.4 x H	0.2 x T	$\alpha_1 = \frac{1}{2}\rho$
2.	Syllabus-II	0.6 x H	0.8 x T	$\alpha_2 = \frac{4}{3}\rho$

Here

H: Total contact hours as per syllabus

T: Total Marks (including choices)

and $\rho = T/H$

Example: Consider a subject CO203, H = 42, Syllabus-I= 16 hours, Syllabus-II = 26 hours.

MID Semester Examination: Total Marks should be uniformly distributed over unit covered in Syllabus-I

END Semester Examination:

Let a question paper is set of total marks (T) = 48,

$$\rho = \frac{8}{7}, \alpha_1 = \frac{4}{7}, \alpha_2 = \frac{32}{21}$$

Desired distribution of the Marks for a course with five Units is shown in the following table:

Table 4: Unit/Topic wise marks distribution

S. No.	Units/Topics	Contact Hours	Desired Marks distribution
1.	I / (t_1, t_2, \dots)	8	$\alpha_1 \times 8 = 5$
2.	II / (t_{13}, t_{14}, \dots)	8	$\alpha_1 \times 8 = 5$
3.	III / (t_{32}, t_{33}, \dots)	10	$\alpha_2 \times 10 = 15$
4.	IV / (t_{43}, t_{44}, \dots)	10	$\alpha_2 \times 10 = 15$
5.	V / (t_{51}, t_{52}, \dots)	6	$\alpha_2 \times 6 = 8$
Total		42	48

2. **Level of difficulty (B):** The paper should have questions with different difficulty levels viz. easy, moderate, and difficult.
 - a. Easy 25% (approx.)
 - b. Moderate 40% (approx.)
 - c. Difficult 35% (approx.)

3. **Level of thinking skills (C):** Most of the questions in the paper should be based on varying order of thinking levels viz. revised Bloom's taxonomy as per following details:
 - L2 Understand 30%
 - L3 Application 40%
 - L4 analyse, L5 evaluate 30% (approx.)

Note:

- a. Action verbs for the different level of thinking skills are given in Appendix-I.

- b. The level of thinking skills (L_1, L_2, L_3, \dots) may vary from course to course. Thus, the deviation from above limits of level of thinking skills should be assigned by course coordinator and approved by the BOS of the respective department. The same should be communicated to office of controller of examination (COE)/Academic council (AC).

4. **Alignment of questions with Course Outcomes (COs) (D):** Questions in a paper should be properly aligned to COs (related to written exam). The weightage of each CO in a written exam is obtained from Table 1. The marks allocated to each CO (desired) should be in the same proportion as weightage of CO in Table 1. For example, let T_{CO} is total marks in a question paper (explained below) then

$$\text{Marks allocated to CO1 (desired)} = (T_{CO} \times W_{CO1_a})/100$$

Note: A question may be associated with more than one CO. Thus, for the purpose calculation of marks allocated to a CO, marks assigned to a question (part of question) shall be counted multiple times. For example, question 2(a), of 3 marks, may be associated with

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CO2, and CO4. Then 3 marks are counted for CO2 as well as CO3. The marks allocated (actual) to each CO (related to written examination) should be calculated in the above manner. Finally, total marks in a question paper T_{CO} is obtained by adding marks allocated to each CO (actual).

- 5. Choice in attempt (E):** There shall be no choice in Mid Term Examination. The question paper for End Term Examination may have choice not more than 20%.

A question paper should fulfil all the above requirements. But, still in order to evaluate question paper according to the said requirements, numerical values should be assigned to all these aspects. A criterion for evaluating the quality of question papers has been developed by the Committee, which is explained and illustrated with the help of some question papers.

Data sheet for Evaluation of the Question Paper

M = Maximum Marks; **T** = Total Marks; **T_{CO}** = Total Marks as per COs and **T_o** = **M/ 0.8**

1. Coverage of Syllabus (A):

Unit	Related Question(s)	Marks Allocated		Evaluation Score
		Desired (d)*	Actual (a)	d-a
1				
2				
3				
4				
5				
Score (A)				Σ(d-a) =

*Refer Table 3 and Table 4 to calculate desired mark allocation.

2. Level of difficulty (B):

Level	Related Question(s)	Marks Allocated		Evaluation Score
		Desired (d)	Actual (a)	d-a
Easy				
Moderate				
Difficult				
Score (B)				Σ(d-a) =

3. Thinking level (C):

Thinking level	Related Question(s)	Marks Allocated		Evaluation Score
		Desired (d)	Actual (a)	d-a
L2				
L3				
L4,L5,L6				
Score (C)				Σ(d-a) =

4. Alignment of questions with COs (D):

COs (Related to written examination)	Related Question(s)	Marks Allocated		Evaluation Score
		Desired (d)	Actual (a)	d-a
CO1				
CO2				
CO4				
Score (C)				Σ(d-a) =

Note: Desired (d) and actual marks (a) allocation to COs should be calculated as explained in point 4.

5. Choice in attempt (E):

$$T_0 = \frac{M}{0.8}$$

$$\text{Score}(\mathbf{E}) = \begin{cases} 0, & \text{if } \mathbf{T} \leq \mathbf{T}_0 \\ \mathbf{T} - \mathbf{T}_0, & \text{else} \end{cases}$$

➤ **Total Evaluation Score (TES) = 0.2 A + 0.3 B + 0.2 C + 0.2 D + 0.1 E**

➤ **Adherence Index (AI) = $1 - \left(\frac{TES}{Max.Marks(M)} \right)$**

Appendix-I

Level	Skill Demonstrated	Question cues / Verbs for tests
1. Remember	<ul style="list-style-type: none"> • Ability to recall of information like facts, conventions, definitions, jargon, technical terms, classifications, categories, and criteria • ability to recall methodology and procedures, abstractions, principles, and theories in the field • knowledge of dates, events, places • mastery of subject matter 	list, define, tell, describe, recite, recall, identify, show, label, tabulate, quote, name, who, when, where
2. Understand	<ul style="list-style-type: none"> • understanding information • grasp meaning • translate knowledge into new context • interpret facts, compare, contrast • order, group, infer causes • predict consequences 	describe, explain, paraphrase, restate, associate, contrast, summarize, differentiate interpret, discuss
3. Apply	<ul style="list-style-type: none"> • use information • use methods, concepts, laws, theories in new situations • solve problems using required skills or knowledge • Demonstrating correct usage of a method or procedure 	calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model, experiment, show, examine, modify
4. Analyse	<ul style="list-style-type: none"> • break down a complex problem into parts • Identify the relationships and interaction between the different parts of a complex problem • identify the missing information, sometimes the redundant information and the contradictory information, if any 	classify, outline, break down, categorize, analyze, diagram, illustrate, infer, select
5. Evaluate	<ul style="list-style-type: none"> • compare and discriminate between ideas • assess value of theories, presentations • make choices based on reasoned argument • verify value of evidence • recognize subjectivity • use of definite criteria for judgments 	assess, decide, choose, rank, grade, test, measure, defend, recommend, convince, select, judge, support, conclude, argue, justify, compare, summarize, evaluate
6. Create	<ul style="list-style-type: none"> • use old ideas to create new ones • Combine parts to make (new) whole, • generalize from given facts • relate knowledge from several areas • predict, draw conclusions 	design, formulate, build, invent, create, compose, generate, derive, modify, develop, integrate

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