Delhi Technological University

Established under Govt. of Delhi Act 6 of 2009

(Formerly Delhi College of Engineering)

Shahbad Daulatpur, Bawana Road, Delhi-110042

No: DTU/2018/Secrecy/Audit of QP/07/ 4308 **Dated: 12.07.2022**
15.07.2022

NOTIFICATION

Subject: **Modified Guidelines for preparing good quality question papers for UG & PG programme.**

The Academic Council in its 32nd meeting held on 18.05.2022 vide agenda number 32.21 considered and approved the Modified Guidelines for preparing good quality question papers for UG & PG Programme. The copy of the Modified Guidelines for Setting Good Quality Question Papers is enclosed.

(Prof. Madhusudan Singh)
Registrar

No: DTU/2018/Secrecy/Audit of QP/07/ 4308 **Dated: 12.07.2022**
15.07.2022

Copy to:-

1. PA to Vice Chancellor for kind information of the Hon'ble Vice Chancellor.
2. All Deans, DTU.
3. All HOD's , DTU
4. Controller of Examination, DTU for kind information.
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(Prof. Madhusudan Singh)
Registrar

Modified Guidelines for Setting Good Quality Question Papers

Delhi Technological University, Delhi

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 were 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 cogitative levels for a course. Other methods such as course project, minor project, major projects, capstone projects etc. are used to assessment of higher order learning levels (as per Bloom's learning levels). 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 learning level (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, ...). 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 CO (desired) W_{CO_d} for written examinations should be in proportion to CO-PO correlation (PO: Program Outcome) by considering CO 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 along with written examination.

Table 1: CO-Syllabus alignment

Course Outcomes (COs)	Topics (Contributing to achieve a CO)	Method of Assessment	Level of learning	Overall weightage for written exams (Desired) : W_{CO_d}
CO1	$t_1, t_2, t_6, t_9, \ldots$	Written Exam, Projects	L_2, L_3, L_6	$W_{CO1\_d} = 15\%$
CO2	$t_2, t_3, t_4, t_{11}, \ldots$	Written Exams	L_2, L_3, L_4	$W_{CO2\_d} = 25\%$
CO3	$t_4, t_5, t_6, t_{20}, \ldots$	Projects	L_5, L_6	$W_{CO\_d} = 0\%$
CO4	$t_1, t_{17}, t_{19}, \ldots$	Written Exams	L_3, L_4	$W_{CO\_d} = 30\%$
. .				

Note that values in the above table are for demonstration purpose only. 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 Term, and End Term Examinations.

- The question paper shall clearly **indicate associated CO and Learning level (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 exam). e.g. Ques. 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, learning level, alignment of questions with COs, and choice in attempt.

The summary 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.	Order of learning level	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:

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

***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 syllabus should be completed till Mid Term Examination, and remaining 60-65% of the syllabus should be completed before the last day of teaching.

   a. Question paper of the Mid Term Examination should be uniformly distributed over the syllabus.
   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:

For the illustrations in this document, contact hours prescribed in the syllabus for different COs are unequal. Thus, to arrive at the **desired allocation** of marks for different COs of the syllabus, the weightages for each CO shall be calculated using marks per contact hours (α). Marks per contact hour would be different for syllabus covered till Mid-Term exam. The same is illustrated below.

H: Total contact hours as per syllabus
T: Total Marks (including choices)

$$\rho = T/H$$

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	0.6 x **H**	0.8 x **T**	$\alpha_2 = \frac{4}{3}\rho$

Example: Consider a subject CO-203, **H** = 42, Syllabus-I= 16 hours,
Syllabus-II = 26 hours.

MID Term Examination: Total Marks should be uniformly distributed over unit covered in Syllabus–I

END Term 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 COs 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, $t_{2,...}$)	8	α_1 x 8 = 5
2.	II / (t_{13}, $t_{14,..}$)	8	α_1 x 8 = 5
3.	III / (t_{32}, $t_{33,..}$)	10	α_2 x 10 = 15
4.	IV / (t_{43}, $t_{44,..}$)	10	α_2 x 10 = 15
5.	V / (t_{51}, $t_{52,..}$)	6	α_2 x 6 = 8
Total		**42**	**48**

2. **Level of difficulty (B):** The question 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. **Learning Level (C):** Most of the questions in the question paper should be based on varying order of learning 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 learning are given in Appendix-I.

b. The order of learning levels (L_1, L_2, L_3,...) may vary from course to course. Thus, the deviation from above limits of learning level should be assigned by course coordinator and approved by the BOS of the respective department.

4. **Alignment of questions with Course Outcomes (COs) (D):** Questions in a question 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

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

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 CO2, and CO4. Then 3 marks will be counted for CO2 as well as CO3. The marks allocated (actual) to each CO (related to written examination) should be calculated in 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 of 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; and $\mathbf{T_o = M/ 0.8}$

1. Coverage of COs (A):

CO	Related Question(s)	Marks Allocated		Evaluation Score
		Desired (d)	Actual (a)	|d-a|
1				
2				
3				
4				
5				
Score (A)				

2. Level of difficulty (B):

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

3. Learning level (C):

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

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)				

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

5. **Choice in attempt (E):**

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

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

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

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

Appendix – 1

Level	Skill Demonstrated	Question cues/Verbs for tests
1. Remember	• 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	• understanding information • grasp meaning • translate knowledge into new context • Interpret facts, compare, contrast • order, group, inter causes • predict consequences	Describe, explain, paraphrase, restate, associate, contrast summarize, differentiate interpret, discuss
3.Apply	• 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	• break down a complex problem into parts • Identify the relationship 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, inter, select
5.Evaluate	• 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 judgements	Assess, decide, choose, rank, grade, test, measure, defend, recommend, convince, select, judge, support, conclude, argue, justify, compare, summarize, evaluate
6.Create	• 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