

Measuring Attainment of Course Outcomes and Program Outcomes – A Simplified Approach as per Self-Assessment Report - June 2015

Bhimasen Soragaon¹, K S Mahesh²

¹(Professor, Department of Industrial Engineering and Management, JSS Academy of Technical Education, Bangalore, India)

²(Asst. Professor, Department of Industrial Engineering and Management, JSS Academy of Technical Education, Bangalore, India)

Abstract: The National Board of Accreditation (NBA) has released a modified version of the self-assessment report (SAR) for Tier - II engineering institutions in the country. Ten different criteria covering different aspects of providing engineering education have been included in the report. These criteria rigorously assess the quality of engineering education offered by different programs of a non-autonomous engineering institution affiliated to a university.

Criterion 3 assesses the attainment of program outcomes (POs) through attainment of course outcomes (COs). Different approaches have been adopted by engineering institutions for the measurement of attainment of COs and POs prior to June 2015 SAR format. Also, criterion 7 depends to a large extent and criterion 2 to some extent on criterion 3. Hence, it is required to measure the attainment of COs and POs as per the guidelines of SAR June 2015 format.

This paper presents a simplified but robust approach for the measurement of attainment of COs and POs. The approach can be extended to measure the attainment of Program Specific Outcomes (PSOs) also. Sample course is considered for showing the measurement of attainment of COs and POs.

Keywords: Self-assessment report, Attainment of Course outcomes, Program outcomes, Tier-II engineering institutions

I. Introduction

Demand for quality of education and employable work-force is ever increasing globally. The continuous innovations in industries, global competition and new business requirements have led to raising the bar for the fresh engineering graduates' employability and success in professional career. National Board of Accreditation (NBA) is one of the platforms that provides a framework to bridge the 'academic- industry gap' and enables better employment prospects for engineering graduates. The process guidelines help in building curriculum to improve not only the technical skills but also the soft-skills of the engineering graduates, which in-turn increases the employability of graduates. By imbibing these process guidelines and principles in Engineering Programs, the institutions can meet the global standards and get recognition across the globe.

The NBA, which insists on 'Outcome Based Education', has published guidelines and templates^{[1][2]} for UG Engineering Programs (Tier-II) to conduct 'Self-Assessment' of their quality of education. The guidelines help the institutions, who conduct UG Engineering Programs, improve their teaching-learning processes to meet the global standards of technical education. The guidelines are presented in the SAR in the form of ten criteria meeting which will enable an engineering institution to get accredited. One of the important criteria is about measuring the attainment of course outcomes (COs), program outcomes (POs) and program specific outcomes (PSOs). Whereas POs are defined by the NBA, COs and PSOs need to be defined or formulated by the respective programs. However, in the earlier versions of SAR, POs should have been defined by the programs based on the graduate attributes.

II. Attainment Of COs, POs And PSOs

The process of attainment of COs, POs and PSOs starts from writing appropriate COs for each course of the program from first year to fourth year in a four-year engineering degree program. The course outcomes are written by the respective faculty member using action verbs of learning levels suggested by Bloom^[3] and Anderson^[4]. Then, a correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (low), 2 being moderate (medium) and 3 being substantial (high). A mapping matrix is prepared in this regard for every course in the program including the elective subjects. The course outcomes written and their mapping with POs are reviewed frequently by a committee of senior faculty members before they are finalized. The following tables show the COs and the CO-PO mapping matrix for a sample course:

Table II.1: Course Outcomes

Course Name: Mechanics of Materials

Course Code: 10ME34

At the end of this course, the student will be able to:

Course Outcome #	Course Outcome
C204.1	Explain the concepts of 'stress' and 'strain' in a structural member subjected loading.
C204.2	Calculate stresses and strains in structural members such as bars, plates, cylinders subjected to fluid pressure, etc. using suitable methods.
C204.3	Analyze bars and beams for energy stored and stresses in them when subjected to different loadings.
C204.4	Analyze beams, columns and shafts for stresses and deflections that occur in them under a variety of applied loads.

C204 – the style of writing course code number as suggested in SAR report.

Table II.2: Mapping of Course Outcomes with Program Outcomes

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C204.1	2	2	2	2	-	-	-	-	-	-	-	-
C204.2	3	3	3	2	-	-	-	-	-	-	-	-
C204.3	3	3	3	2	-	-	-	-	-	-	-	-
C204.4	3	3	3	2	-	-	-	-	-	-	-	-
C204	2.75	2.75	2.75	2.00	-	-	-	-	-	-	-	-

From the mapping matrix of COs and POs for all the courses as above, a 'Program level Course-PO matrix' of all the courses including first year courses is prepared. Table II.3 below shows 'Course-PO' mapping matrix. For convenience and simplicity, only few courses are shown with hypothecated mapping values except for C204 course.

Table II.3 Program level Course-PO matrix for all the courses including first year courses

COURSE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C101	3.00	3.00	2.00	---	2.50	1.75	---	---	---	---	---	---
C102	2.75	2.00	3.00	2.00	---	2.00	---	---	2.00	---	---	---
C103	---	---	---	---	---	---	3.00	2.60	2.5	3.00	---	2.00
.												
.												
C204	2.75	2.75	2.75	2.00	-	-	-	-	-	-	-	-
C205	2.00	3.00	2.5	1.50	2.00	---	---	2.00	---	---	2.00	---
.												
.												
C301	3.00	2.00	2.60	2.00	2.00	---	---	---	---	---	---	---
C302	---	3.00	3.00	2.50	---	---	2.00	1.75	2.00	---	---	2.00
.												
.												
C401	2.50	2.60	2.00	---	3.00	2.00	---	2.00	---	2.50	---	2.50
.												
C404	3.00	3.00	3.00	3.00	2.00	2.00	2.50	3.00	---	2.50	3.00	---

II.1 Attainment of COs

Course Outcomes are narrower statements that describe what students are expected to know, and be able to do at the end of each course. These relate to the skills, knowledge, and behavior that students acquire in their matriculation through the course^[5].

In a university affiliated college, the CO attainment levels can be measured based on the results of the internal assessment and external examination conducted by the university. This is a form of direct measurement of attainment. In the university to which the author's institute is affiliated to, three internal assessment tests are conducted for each course in a semester. In each test, the percentage of students who achieve a set target (usually, 60% of the maximum marks, i.e., 15 of 25) for the COs that are covered is computed. After the three tests, the average of these percentages is computed to decide the attainment level. NBA has given, in its SAR format, the following example guidelines for arriving at an attainment level:

Attainment Level 1: 60% of students score more than 60% marks out of the maximum relevant marks.

Attainment Level 2: 70% of students score more than 60% marks out of the maximum relevant marks.

Attainment Level 3: 80% of students score more than 60% marks out of the maximum relevant marks.

Thus, the average of percentage of students attaining all the COs decides the CO attainment level. For the case example considered, in the internal assessment (IA) tests, the target attainment level for each CO and for each student is set at 60% of the maximum marks for a question or a group of questions. The percentage of students attaining this target level of each CO is computed and the average of these percentages is considered for deciding the *attainment level of course outcome as shown above in the example guidelines*. The process of computing CO attainment in internal assessment is shown in Table II.4 (next page).

From the table, it is found that the percentages of students attaining CO1, CO2, CO3, and CO4 are 100 (1.00), 63 (0.63), 98 (0.98), and 70.5 $\{(0.87+0.54)/2\}$ respectively. Hence, the average percentage of students who attained all the COs is 82.875 (0.82875). This corresponds to Course Attainment level of 3.

Similarly, after the declaration of the university results, the percentage of students who attained the COs is computed. Here, it is assumed that the questions answered by a student cover all the course outcomes defined for that course. From Table II.4 (please refer last two columns), it is found that only 8 percent of students have scored more than 60% of the maximum marks in the course. Hence, the attainment level in this case is 0 as per the *example guidelines* suggested in the SAR of NBA.

Attainment Level 1: 60% of students scoring more than university average marks or set attainment level.

Attainment Level 2: 70% of students scoring more than university average marks or set attainment level.

Attainment Level 3: 80% of students scoring more than university average marks or set attainment level.

In a meeting of senior faculty members in the author's institute, many discussions were held on setting the target attainment level (percent of marks scored by a student in a course) for deciding the course attainment level. The author argued that this target should be set based not only on the university previous results for 3-4 years but also on the type of course (subject) and the quality of students admitted. In engineering programs, there are few courses which students feel rather difficult compared to other courses. Few example courses to cite in Mechanical Engineering program are 'Thermodynamics', 'Mechanics of Materials', 'Dynamics of Machinery', 'Heat Transfer', etc. where university results vary drastically every year.

In the case example considered in this paper, the target percent of marks scored by the students is set by the course faculty member based on the university results of the course in the institute in the past three years. The average pass percentage in that course was around 40% of which only about 18% percent of students scored 60 marks or more out of maximum 100 marks. Hence, the target was reduced to 42% (that is, a student should score 42 marks or more for attaining a CO). The guidelines for deciding the attainment levels are then modified as

Attainment Level 1: 60% of students scoring more than 42% of maximum marks.

Attainment Level 2: 70% of students scoring more than 42% of maximum marks.

Attainment Level 3: 80% of students scoring more than 42% of maximum marks.

From the table, it is found that only 40% of students have scored more than 42% of marks. Hence, the CO attainment level in SEE is ZERO.

II.2 Overall Course Outcome Attainment

The overall CO attainment level in the course considered is then computed as

Overall CO attainment level = 50% of CO attainment level in IA tests + 50% of CO attainment level in SEE

$$\text{Overall CO attainment level} = 0.5 \times 3 + 0.5 \times 0 = 1.5.$$

It is assumed here that all the COs defined for the course are covered in SEE. However, it is difficult to know the coverage of COs question-wise since the question paper is set by different faculty members.

The example guidelines in the SAR suggest to use a proportion of 80% of weightage to SEE and 20% weightage to internal assessment for computing 'overall CO attainment for a course. However, a decision was taken from the discussions in several meetings in the institute to use 50% weightage each for SEE and internal assessment. Hence it is decided to use the above weight proportion for computing overall CO attainment for each course. The above procedure of computing overall CO attainment is to be repeated for each course from first year to final year in an academic year (including opted electives, project work and technical seminars in final year) in order to enable computation of PO and PSO attainment levels.

II.3 Attainment of POs

Program Outcomes (POs) are one step broader statements than COs that describe what students are expected to know and be able to do upon the graduation. These relate to the skills, knowledge, and behavior that students acquire in their matriculation through the program (NBA Tier-II Manual, January 2013) ^[5]. Earlier to June 2015 format of SAR, the programs used to define the POs based on the graduate attributes. The June 2015

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format of SAR includes POs defined common to all programs. However, NBA suggests programs to define 2 – 4 POs specific to an engineering program and are called ‘Program Specific Outcomes (PSOs)’ [1]. It is required to compute the attainment levels for PSOs in addition to computing attainment of POs.

Program outcomes and ‘program specific outcomes’ are attained through the attainment of COs. This is called direct attainment of POs and PSOs. The overall CO attainment value as computed in section II.2 and the CO-PO mapping values as computed in Table II.2 are used to compute the attainment of POs. Similarly, the overall CO attainment value as computed in section II.2 and CO-PSO mapping (*not shown in this paper*) values are used to compute the attainment of PSOs.

Table II.4: Percentage of students attaining course outcomes and attainment level

me: Mechanics of Material		POS	PO1 - PO4	Target Level	PO1 - PO4	Target Level	PO1 - PO4	Target Level	PO1 - PO4	Target Level	PO1 - PO4	Target Level	University Result	Target Level
Sl No	USN	Name of the Student	TEST 1				TEST 2				TEST 3		D1-8 (100M)	>=42%
			CO1	>=60%	CO2	>=60%	CO3	>=60%	CO4	>=60%	CO4	>=60%		
			Q1,2,3 (5M)		Q4,5,6 (20M)		Q1,2,3 (10M)		Q4, Q5 (15M)		Q1,2,3,4(25M)			
1	1XX12M027	STUDENT 1	4	Y	10	N	8	Y	7	N	AB	NA	1	N
2	1XX12M028	STUDENT 2	5	Y	3	N	8	Y	13	Y	10	N	7	N
3	1XX12M029	STUDENT 3	5	Y	20	Y	10	Y	15	Y	AB	NA	61	Y
4	1XX12M030	STUDENT 4	5	Y	19	Y	10	Y	15	Y	AB	NA	35	N
5	1XX12M031	STUDENT 5	4	Y	20	Y	10	Y	15	Y	AB	NA	40	N
6	1XX12M032	STUDENT 6	4	Y	13	Y	9	Y	15	Y	AB	NA	35	N
7	1XX12M033	STUDENT 7	4	Y	17	Y	8	Y	14	Y	AB	NA	54	Y
8	1XX12M034	STUDENT 8	4	Y	12	Y	10	Y	15	Y	AB	NA	49	Y
9	1XX12M035	STUDENT 9	5	Y	20	Y	10	Y	15	Y	AB	NA	42	Y
10	1XX12M036	STUDENT 10	5	Y	20	Y	10	Y	15	Y	AB	NA	35	N
11	1XX12M037	STUDENT 11	5	Y	10	N	10	Y	10	Y	AB	NA	42	Y
12	1XX12M038	STUDENT 12	4	Y	10	N	10	Y	15	Y	AB	NA	27	N
13	1XX12M039	STUDENT 13	4	Y	20	Y	10	Y	15	Y	AB	NA	57	Y
14	1XX12M040	STUDENT 14	3	Y	17	Y	10	Y	14	Y	AB	NA	35	N
15	1XX12M041	STUDENT 15	4	Y	18	Y	10	Y	15	Y	AB	NA	48	Y
16	1XX12M042	STUDENT 16	4	Y	7	N	10	Y	8	N	9	N	38	N
17	1XX12M043	STUDENT 17	5	Y	11	N	10	Y	15	Y	17	Y	45	Y
18	1XX12M044	STUDENT 18	5	Y	19	Y	10	Y	15	Y	AB	NA	56	Y
19	1XX12M045	STUDENT 19	4	Y	20	Y	10	Y	15	Y	AB	NA	55	Y
20	1XX12M046	STUDENT 20	5	Y	20	Y	10	Y	15	Y	AB	NA	41	N
21	1XX12M047	STUDENT 21	4	Y	11	N	8	Y	8	N	20	Y	40	N
22	1XX12M048	STUDENT 22	4	Y	20	Y	10	Y	15	Y	AB	NA	23	N
23	1XX12M049	STUDENT 23	4	Y	8	N	10	Y	15	Y	AB	NA	39	N
24	1XX12M050	STUDENT 24	4	Y	14	Y	AB	NA	AB	NA	18	Y	15	N
25	1XX12M051	STUDENT 25	5	Y	17	Y	AB	NA	AB	NA	AB	NA	17	N
26	1XX12M052	STUDENT 26	4	Y	10	N	10	Y	15	Y	AB	NA	63	Y
27	1XX12M053	STUDENT 27	5	Y	18	Y	10	Y	15	Y	AB	NA	35	N
28	1XX12M054	STUDENT 28	4	Y	20	Y	10	Y	15	Y	AB	NA	26	N
29	1XX12M055	STUDENT 29	5	Y	12	Y	8	Y	8	N	22	Y	21	N
30	1XX12M056	STUDENT 30	4	Y	18	Y	10	Y	15	Y	AB	NA	35	N
31	1XX12M057	STUDENT 31	5	Y	17	Y	10	Y	12	Y	AB	NA	35	N
32	1XX12M058	STUDENT 32	5	Y	16	Y	10	Y	15	Y	AB	NA	27	N
33	1XX12M059	STUDENT 33	3	Y	6	N	9	Y	12	Y	20	Y	50	Y
34	1XX12M060	STUDENT 34	4	Y	16	Y	10	Y	15	Y	AB	NA	21	N
35	1XX12M061	STUDENT 35	5	Y	20	Y	10	Y	15	Y	AB	NA	68	Y
36	1XX12M062	STUDENT 36	5	Y	10	N	10	Y	10	Y	AB	NA	55	Y
37	1XX12M063	STUDENT 37	5	Y	20	Y	10	Y	15	Y	AB	NA	47	Y
38	1XX12M064	STUDENT 38	5	Y	18	Y	10	Y	15	Y	AB	NA	44	Y
39	1XX12M065	STUDENT 39	4	Y	17	Y	8	Y	14	Y	AB	NA	47	Y
40	1XX12M066	STUDENT 40	5	Y	19	Y	10	Y	15	Y	AB	NA	42	Y
41	1XX12M067	STUDENT 41	4	Y	19	Y	7	Y	15	Y	AB	NA	44	Y
42	1XX12M068	STUDENT 42	5	Y	10	N	4	N	14	Y	AB	NA	67	Y
43	1XX12M069	STUDENT 43	AB	NA	AB	NA	10	Y	12	Y	15	Y	9	N
44	1XX12M070	STUDENT 44	5	Y	3	N	10	Y	5	N	14	N	1	N
45	1XX12M071	STUDENT 45	3	Y	3	N	9	Y	15	Y	0	N	8	N
46	1XX12M072	STUDENT 46	3	Y	3	N	9	Y	12	Y	11	N	10	N
47	1XX12M073	STUDENT 47	4	Y	0	N	AB	NA	AB	NA	13	N	2	N
48	1XX12M074	STUDENT 48	4	Y	2	N	8	Y	1	N	20	Y	6	N
49	1XX12M075	STUDENT 49	4	Y	12	Y	10	Y	15	Y	AB	NA	25	N
50	1XX12M076	STUDENT 50	3	Y	5	N	10	Y	14	Y	AB	NA	23	N
			Y	49		31		46		41		7		20
			N	0		18		1		6		6		30
			NA	1		1		3		3		37		0
			CO attainment	1.00		0.63		0.98		0.87		0.54		0.4
			Ave. att.	0.8287						0.705				
			Att. Level	3									Att. Level	0

Using Table II.4 and the overall course attainment levels of all the courses, the PO attainment values are computed as shown in Table II.5 (next page).

Sample computation of PO values:

- Cell number C101-PO1: PO attainment vale = (Corresponding cell value from Table II.3 x Overall CO attainment value for course C101)/3
= (3x2.3)/3 = 2.3
- Cell number C103-PO9: PO attainment vale = (Corresponding cell value from Table 2.3 x Overall CO attainment value for course C103)/3
= (2.5 x 2.5)/3 = 2.08

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- Cell number C204-PO4: PO attainment vale = (Corresponding cell value from Table 2.3 x Overall CO attainment value for course C204)/3
= (2.0 x 1.5)/3 = 1.00

As per the guidelines of the SAR, the overall attainment of outcomes of a program (POs) is computed by adding direct attainment and indirect attainment values in the proportion of 80:20^[1]. That is, 80% of direct attainment and 20% of indirect attainment is taken into consideration.

The direct attainment of POs is the average of individual PO attainment values. From table II.5, the direct attainment of PO1 is (2.30+2.57+1.34+2.60+1.375+2.17+3.00)/6 = 2.19. The direct attainment of other POs is computed in this manner and is shown in the table.

For determining indirect attainment of POs and PSOs, SAR suggests student exit surveys, employer surveys, co-curricular activities, extracurricular activities, etc. In this paper, student exit survey alone is considered for this purpose. A questionnaire was designed (as shown in the last page) for this purpose and the average responses of the outgoing students for each PO is computed and entered in the corresponding row of Table II.5. Finally, overall PO attainment values are computed by adding direct and indirect PO attainment values in the proportion of 80:20 respectively. The computed values are compared with the set target values of POs. The target values are set in consultation with the members of ‘departmental advisory board (DAB)’ along with the faculty members of the program. It is argued that the target PO attainment value for each PO must be different since the contribution of courses for PO attainment is different. Accordingly, each PO was set with different target value as shown in the last row of Table II.5. It is found from the table that all the POs are attained. An action plan for POs that do not reach the target attainment value must be designed and implemented in the subsequent academic year. Criterion 7 of the SAR deals with target values of POs, and action plans needed for attaining POs whose attainment values are less than the set target values.

A table similar to Table II.5 is to be prepared for computing the attainment of PSOs based on CO-PSO mapping relationship values and overall course attainment levels.

Table II.5: PO attainment values

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Overall CO Attain.
C101	2.30	2.30	1.53	---	1.92	1.34	---	---	---	---	---	---	2.30*
C102	2.57	1.87	2.80	1.87	---	1.87	---	---	1.87	---	---	---	2.80*
C103	---	---	---	---	---	---	2.50	2.17	2.08	2.50	---	1.67	2.50*
.
.
C201	1.34	2.00	1.67	1.50	1.34	---	---	1.34	---	---	1.34	---	2.00*
C202	2.60	1.73	2.25	1.73	1.73	---	---	---	---	---	---	---	2.60*
C203	---	2.80	2.80	2.33	---	---	1.87	1.63	1.87	---	---	1.87	2.80*
C204	1.375	1.375	1.375	1.00	-	1.5							
.
.
C301	2.17	2.25	1.73	---	2.60	1.73	---	1.73	---	2.17	---	2.17	2.60*
.
.
C404	3.00	3.00	3.00	3.00	2.00	2.00	2.50	3.00	---	2.50	3.00	---	3.00*
Direct PO attain.	2.19	2.28	2.25	2.09	1.92	1.74	2.29	1.97	1.94	2.39	2.17	1.90	
#Indirect PO attain.	2.25	2.10	2.05	1.95	1.90	1.95	2.50	2.88	2.72	2.82	2.98	2.36	
Overall PO attain.	2.20	2.39	2.29	2.13	1.95	1.78	2.33	2.15	2.09	2.47	2.33	1.99	
#Target set	2.00	2.00	2.00	2.00	1.50	1.50	2.00	2.00	2.00	2.00	2.00	1.50	

*Assumed overall CO attainment values

#Hypothecated values

III. Conclusion

Criterion 3 of ‘self-assessment report’ of NBA is an important criterion and is an input for criterion 7. The criterion gives an indication of how a program is performing in terms of attainment values of course outcomes and program outcomes. The paper has proposed a simplified methodology for measuring or computing the attainment of course outcomes and hence program outcomes and program specific outcomes (PSOs). The attainment values of POs and PSOs thus computed can be compared with the target attainment

values and action plans may be laid for those POs and PSOs whose attainment value is less than the target value. The methodology can also be used for the measurement of COs, POs and PSOs in an autonomous, non-affiliated institution.

References

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Exhibit: Questionnaire for Indirect Measurement of Program Outcomes

XXXXXXXXX College of Engineering and Technology, Bangalore
Department of XXXXXXXXX Engineering

Questionnaire for Indirect PO attainment

Dear Student,

It's our pleasure to note that you are completing your graduation in a few days. We wish and hope that you have assimilated all that is required for your successful career.

Kindly give your response on the following outcomes you have gained through your four-year degree program.

- Head of the Department and Faculty Members

At the end of my degree program, I am able to:

Ranking: 3 – Strongly agree, 2 – Agree, 1 – Average

- | | | | |
|---|-------------------------|-------------------------|-------------------------|
| 1. Apply the basic knowledge of mathematics, science and engineering fundamentals to solve engineering problems. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 2. Identify, formulate and analyze complex engineering problems. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 3. Design solutions for complex engineering problems with a concern for public health and safety, cultural, societal, and environmental issues. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 4. Conduct research based investigation by using different statistical methods and interpret the data. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 5. Select, create and use appropriate modern IT tools and techniques to predict and model engineering activities. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 6. Apply contextual knowledge to assess societal, health, safety, legal and cultural issues with respect to professional engineering practices. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 7. Understand the impact of the professional engineering solutions in societal and environmental contexts. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 8. Apply professional ethics in engineering practices. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 9. Function as an individual and as a member in diverse and multidisciplinary settings. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 10. Communicate effectively on engineering activities with engineering community and with society at large. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 11. Work as a leader and as a member in multidisciplinary environment during project management. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |
| 12. Recognize the need for lifelong learning for continuous enhancement and upgradation of my knowledge in view of technological changes. | <input type="radio"/> 3 | <input type="radio"/> 2 | <input type="radio"/> 1 |

Name:

USN:

Year of Completing VIII Sem: