

**Test: CLAT-2 /Batch 1**

**Course Code & Title: 21GNH101J – Philosophy of Engineering**

**Year & Sem: I / I**

**Date: 03/011/2023**

**Duration: 1 Period (50 mins)**

**Max. Marks: 15**

**Course Articulation Matrix:**

CO	21GNH101J- PHILOSOPHY OF ENGINEERING Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Analyze the relation between Arts, Mathematics, Science, Technology and Engineering and desired attributes of an engineer	1	-	-	3	-	1	-	-	3	3	-	3	-	-	-
2	Build ontologies for systems engineering using concept/mind mapping techniques	3	-	-	3	3	-	-	-	3	3	-	3	-	-	-
3	Analyze the knowledge base in engineering, distinctive features of engineering design and RIASEC mode	3	-	-	3	-	-	-	-	3	3	-	3	-	-	-
4	Illustrate the engineering design process for the given application, analyze the requirements of CDIO engineers	3	1	3	3	3	-	-	-	3	3	-	3	-	-	-
5	Evaluate designs on their environmental and societal aspects and do organizational analysis on profession engineering organizations	3	3	3	3	-	3	3	3	3	3	-	3	-	-	-

**Part – A (5x1 = 5 Marks)**

**Answer all the questions**

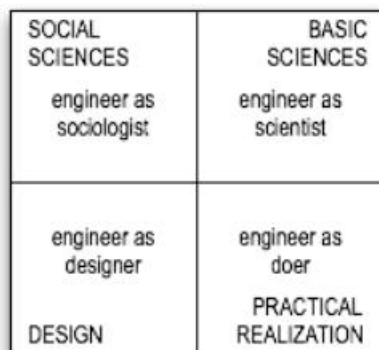
Q. No	Question	Marks	B L	C O	P O
1.	“Scientists study the world as it is; engineers create the world that has never been.” The statement was given by: a) Theodore von Kármán      b) Thomas Hobbes c) Friedrich Nietzsche      d) Aristotle	1	1	3	1
2.	----- personalities are concerned with people and their welfare. a) Realistic      b) Investigative c) Social      d) Enterprising	1	1		4
3.	Holland Code is decided by top _____ personality in a person. a) Two      b) Three c) Four      d) Six	1	2	3	9
4.	The _____ model is the generic process traditionally used by instructional designers and training developers. a) RAISEC      b) ADDIE c) CDIO      d) STEM	1	1	4	2
5.	Which process is not used in scientific methodology? a) Background research      b) Brain storming c) Analyzing data      d) Constructing hypothesis	1	2	4	3

**Part – B (2 x 5 = 10 Marks)**

**Instructions: Answer ANY 2 Questions**

6	Discuss four dimensions of engineering.  <b>Solution:</b>  In the discussion of engineering knowledge it is helpful to think of engineering as comprising four major dimensions (Fig. 1): the dimensions of the basic sciences, of the social sciences, of design, and of practical accomplishment. This lets us think of the	5	3	3	1
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engineer as a professional who combines, in variable proportions, the qualities of a scientist, a sociologist, a designer, and a doer.



The dimension inspired by the basic sciences views engineering as the application of the natural and exact sciences, stressing the values of logics and rigour, and seeing knowledge as produced through analysis and experimentation. Research is the preferred modus operandi of this dimension, where the discovery of first principles is seen as the activity leading to higher recognition. The social dimension of engineering sees engineers not just as technologists, but also as social experts, in their ability to recognize the eminently social nature of the world they act upon and the social complexity of the teams they belong to. The creation of social and economic value and the belief in the satisfaction of end users emerge as central values in this dimension of engineering. **3**

**marks**

The design dimension sees engineering as the art of design. It values systems thinking much more than the analytical thinking that characterizes traditional science. Its practice is founded on holistic, contextual, and integrated visions of the world, rather than on partial visions. Typical values of this dimension include exploring alternatives and compromising. In this dimension, which resorts frequently to non-scientific forms of thinking, the key decisions are often based on incomplete knowledge and intuition, as well as on personal and collective experiences. The fourth mode views engineering as the art of getting things done, valuing the ability to change the world and overcoming complexity with flexibility and perseverance. It corresponds to the art of the homo faber, in its purest expression, and to the ability to tuck up one's sleeves and get down to the nitty-gritty. In this dimension, the completed job, which stands before the world, leads to higher recognition. **[2 marks]**

7

Explain RAISEC model and its significance in career counselling. Provide detailed analysis of how each of six personality types can help individual make informed career choice.

Solution:

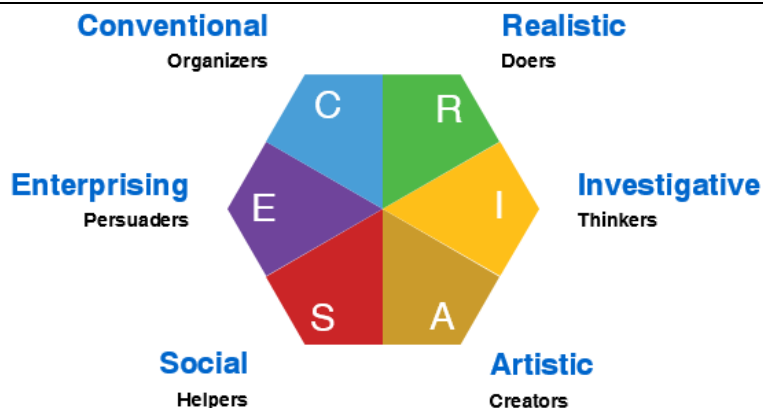
John Holland theorized that personality and work environment are measurable, and that the two should be matched in order to find a satisfying career. Holland's theory describes six basic personality types (**RIASEC**, described below). One type is typically dominant; an individual's top three types -- in order -- make up that person's Holland Code. The goal is to match an individual's code, or personality type, with his or her career.

5

4

3

12



**3 marks**

### **Realistic - R (Doers)**

Like to work with their hands and focus on things in the physical world & use physical skills. Like to repair and work with tools, machines, or animals; outdoor work is often preferred. Prefer problems that are concrete rather than abstract; want practical solutions that can be acted out. Characteristics include stable, assertive, physical strength, practical.

**Holland typology:** realistic practical frank nature lover curious concrete selfcontrolled ambitious persistent athletic mechanical thrifty stable reserved independent systematic.

### **Investigative - I (Thinkers)**

Tend to focus on ideas. Like to collect and analyze data and information of all kinds. Curious and tend to be creative and original. Task oriented and motivated by analyzing and researching. Tend to prefer loosely structured situations with minimal rules or regulations. Prefer to think through rather than act out problems. Characteristics include reserved, independent, analytical, logical.

**Holland typology:** investigative inquisitive scientific precise cautious self-confident reserved independent analytical observant scholarly curious introspective broad-minded logical.

### **Artistic - A (Creators)**

Creative and tend to focus on self-expression through all kinds of mediums: materials, music and words, as well as systems and programs. Able to see possibilities in various settings and are not afraid to experiment with their ideas. Like variety and tend to feel cramped in structured situations. Deal with problems in intuitive, expressive, and independent ways. Tend to be adverse to rules. Characteristics include intuitive, creative, expressive, unconventional.

**Holland typology:** artistic creative imaginative unconventional independent original impulsive courageous complicated nonconforming intuitive innovative emotional expressive introspective sensitive open idealistic.

### **Social - S (Helpers)**

Concerned with people and their welfare. Tend to have well developed communications skills and like to help, encourage, counsel, guide, train, or facilitate others. Enjoy working with groups or individuals, using empathy and an ability to identify and solve problems. Value cooperation and consensus. Deal with problems through feelings. Flexible approach to problems. Characteristics include humanistic, verbal, interpersonal, responsible.

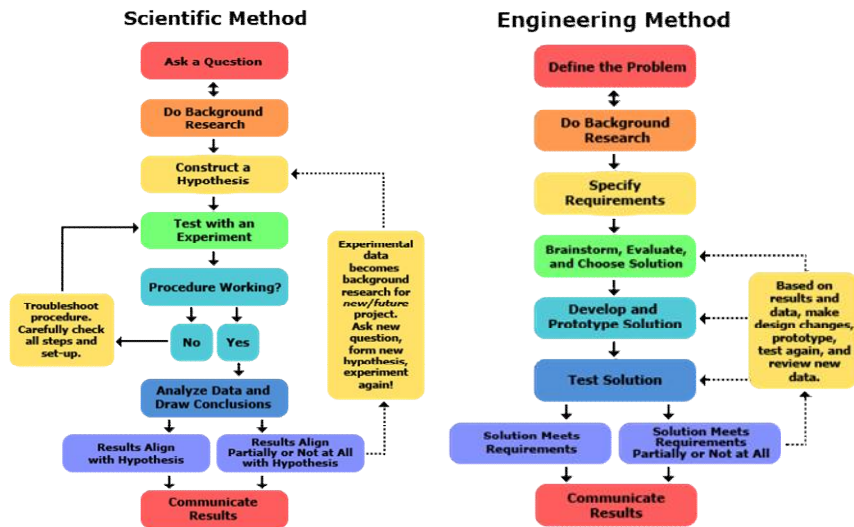
**Holland typology:** social friendly idealistic outgoing cooperative responsible kind persuasive patient helpful insightful understanding generous forgiving empathetic.

	<p><b>Enterprising - E (Persuaders)</b></p> <p>Work with and through people, providing leadership and delegating responsibilities for organizational and/or financial gain. Goal-oriented and want to see results. Tend to function with a high degree of energy. Prefer business settings, and often want social events to have a purpose beyond socializing. Attack problems with leadership skills. Decision-Maker. Characteristics include persuasive, confident, demonstrate leadership, interest in power/status.</p> <p><b>Holland typology:</b> enterprising self-confident sociable enthusiastic adventurous impulsive inquisitive talkative spontaneous assertive persuasive energetic popular ambitious optimistic extroverted.</p> <p><b>Conventional - C (Organizers)</b></p> <ul style="list-style-type: none"><li>Like to pay a lot of attention to detail and organization, and prefer to work with data, particularly in the numerical, statistical, and record-keeping realm. Have a high sense of responsibility, follow the rules, and want to know precisely what is expected. Prefer clearly defined, practical problems and to solve problems by applying rules. Oriented to carrying out tasks initiated by others. Characteristics include conscientious, efficient, concern for rules and regulation, orderly.</li></ul> <p><b>Holland typology:</b> conventional well-organized accurate numerically-inclined methodical efficient orderly thrifty structured ambitious persistent conscientious conforming practical systematic polite obedient. <b>2 marks</b></p>																		
8	<p>Explain fundamental differences between scientific method and engineering design method. Provide a detailed comparison and how they complement each other in the context of problem solving and innovations in the field of science and engineering.</p> <p><b>Solution:</b></p> <table><tr><th>The Scientific Method</th><th>The Engineering Design Process</th></tr><tr><td>State your question</td><td>Define the problem</td></tr><tr><td>Do background research</td><td>Do background research</td></tr><tr><td>Formulate your hypothesis, identify variables</td><td>Specify requirements</td></tr><tr><td>Design experiment, establish procedure</td><td>Create alternative solutions, choose the best one and develop it</td></tr><tr><td>Test your hypothesis by doing an experiment</td><td>Build a prototype</td></tr><tr><td>Analyze your results and draw conclusions</td><td>Test and redesign as necessary</td></tr></table>	The Scientific Method	The Engineering Design Process	State your question	Define the problem	Do background research	Do background research	Formulate your hypothesis, identify variables	Specify requirements	Design experiment, establish procedure	Create alternative solutions, choose the best one and develop it	Test your hypothesis by doing an experiment	Build a prototype	Analyze your results and draw conclusions	Test and redesign as necessary	5	3	4	2
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Communicate results

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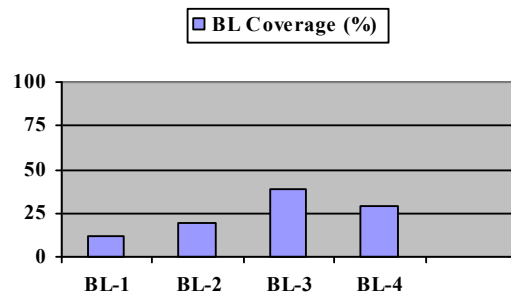
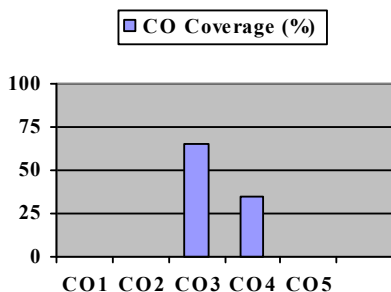
### 3 marks, Either table or diagram



In real life, the distinction between science and engineering is not always clear. Scientists often do some engineering work, and engineers frequently apply scientific principles, including the scientific method. Much of what we often call "computer science" is actually engineering—programmers creating new products. Your project may fall in the gray area between science and engineering, and that's OK. Many projects, even if related to engineering, can and should use the scientific method.

However, if the objective of your project is to invent a new product, computer program, experience, or environment, then it makes sense to follow the engineering design process. **2 Marks**

#### Course Outcome (CO) and Bloom's level (BL) Coverage in Questions



#### Evaluation Sheet

Name of the Student:

Register No.:

Part- A (5 x 1= 5 Marks)					
Q. No	CO	PO	Maximum Marks	Marks Obtained	Total
1	3	1	1		
2	3	4	1		

3	3	9	1		
4	4	2	1		
5	4	3	1		
Part- B (2 x 4= 8 Marks)					
6	3	1	4		
7	3	6	4		
8	4	1	4		

**Consolidated Marks:**

CO	Maximum Marks	Marks Obtained
3	13	
4	7	
<b>Total</b>	<b>20</b>	

PO	Maximum Marks	Marks Obtained
1	6	
2	6	
3	1	
4	1	
9	1	
12	5	
<b>Total</b>	<b>20</b>	

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**Signature of the Course Teacher:**