

Test: CLAT-1 /Batch 2

Course Code & Title: 21GNH101J Philosophy of Engineering

Year & Sem: I / II

Date: 17/04/2023

Duration: 1 Hour

Max. Marks: 25

**Course Articulation Matrix:**

	21GNH101J- PHILOSOPHY OF ENGINEERING	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
CO	Course Outcomes (COs)	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	-	-	-

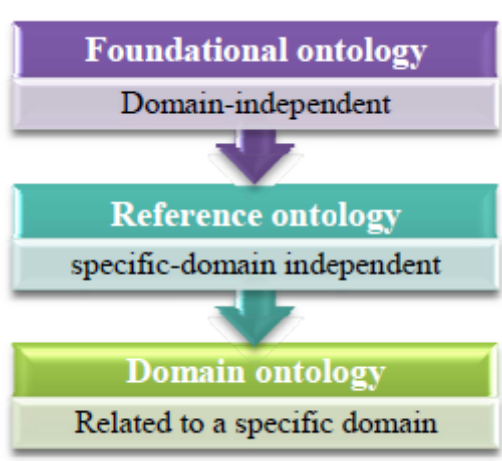
**Part – A (5x1 = 5 Marks)**

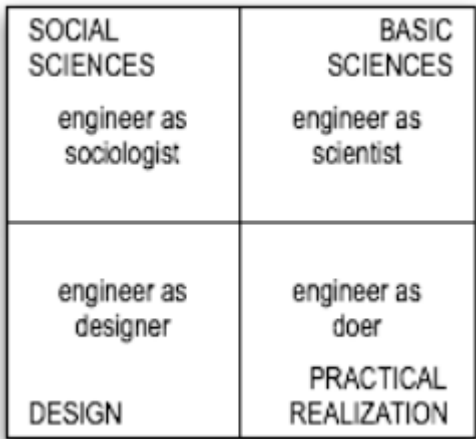
Answer all the questions

Q. No	Question	Marks	BL	CO	PO
1.	c) meta physics	1	2	CO2	1
2.	b) Product Development	1	1	CO2	1
3.	c) John Holland	1	1	CO3	1
4.	d) Engineering	1	1	CO3	1
5.	c) 6	1	1	CO3	1

**Part – B (2 x 4 = 8 Marks)**

**Instructions: Answer ANY 2 Questions**

6	 <p><b>Reference Ontologies</b></p> <p>There appear to be three central characteristics of reference ontologies (ROs). We examine these in</p>	4	1	CO2	1
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	<p>turn. Theoretical Focus on representation The first characteristic of ROs is their theoretical focus on representation. ROs are constructed without any particular concerns for computational efficiency. Consequently, ROs avail themselves of (at least) the language of full first-order logic. Specifically, ROs avail themselves of:</p> <ul style="list-style-type: none"> <li>• Arbitrary n-place predicates;</li> <li>• Full classical negation;</li> <li>• Unbounded, arbitrarily nested quantifiers.</li> </ul> <p>The focus of ROs on representation is most clearly indicated in their generally unapologetic use of full first-order languages. The three features above are particularly noteworthy, as unrestricted use of any of them can render complete deductive procedures intractable, even undecidable. Philosophical inclination toward realism The second feature of ROs is that their inclination toward philosophical realism.</p>				
7	 <p>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</p>	4	4	CO3	4

	satisfaction of end users emerge as central values in this dimension of engineering.				
8	<p>The benefits of a closed-loop system include:</p> <ul style="list-style-type: none"> <li>• Better for the environment</li> <li>• Does not affect performance or price</li> <li>• Fewer carbon emissions in manufacturing</li> <li>• As programs scale, they become cheaper and more effective</li> </ul>	4	1	CO2	1

**Part – C (1 x 12 = 12 Marks)**

9a	<p><b>Reference Ontology and Application Ontology</b></p> <p><b>Reference Ontologies</b></p> <p>There appear to be three central characteristics of reference ontologies (ROs). We examine these in turn. Theoretical Focus on representation The first characteristic of ROs is their theoretical focus on representation. ROs are constructed without any particular concerns for computational efficiency. Consequently, ROs avail themselves of (at least) the language of full first-order logic. Specifically, ROs avail themselves of:</p> <ul style="list-style-type: none"> <li>• Arbitrary n-place predicates;</li> <li>• Full classical negation;</li> <li>• Unbounded, arbitrarily nested quantifiers.</li> </ul> <p>The focus of ROs on representation is most clearly indicated in their generally unapologetic use of full first-order languages. The three features above are particularly noteworthy, as unrestricted use of any of them can render complete deductive procedures intractable, even undecidable. Philosophical inclination toward realism The second feature of ROs is that their inclination toward philosophical realism.</p> <p>There are generally two elements of this realism:</p> <ul style="list-style-type: none"> <li>• Metaphysical realism;</li> <li>• Epistemological realism.</li> </ul> <p>According to metaphysical realism, the World (Reality, What There Is) exists objectively in itself,</p>	12	2	CO2	12
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<p>independent of any mind. According to epistemological realism, the World is knowable by us. Thus, the philosophical standpoint underlying most ROs is that the World and its properties are there to be discovered. This implies, in turn, that the World, being objective and knowable, puts constraints on what we can say about it. Thus, in our ontologies can get it wrong. An RO is right just insofar as it accurately reflects, as far as it goes, the way the World is. This leads to our third feature of ROs. Methodological emphasis on Truth Because our ROs can be wrong, there is in the construction of an RO a good reason to place a strong methodological emphasis on Truth.</p> <p>This has two practical implications:</p> <ul style="list-style-type: none"><li>• The central function of an ontology is to represent the World accurately and comprehensively; hence:</li><li>• The quality of an ontology a function of its accuracy and comprehensiveness.</li></ul> <p>ROs are all about getting the world — or some important piece of it — right.</p> <p>An ontology of time purports to describe its actual nature, to proffer the sober metaphysical truth on such matters as whether time is discrete, continuous, some combination of the two; whether there are timepoints or intervals, or both, and so on. Consequently, the quality of an ontology is judged along two dimensions: its accuracy — i.e.,</p> <p>whether what it purports to be the case is in fact the case — and its comprehensiveness — i.e., whether it takes in a sufficiently broad spectrum of facts as to be significant.</p> <p><b>Application Ontologies</b></p> <p>Corresponding to our three features of reference ontologies are three salient features of application ontologies (AOs).</p> <p><b>Theoretical Focus on Reasoning</b></p> <p>Unlike ROs, AOs are typically designed with some sort of computational application — and hence its attendant expressive limitations — in mind. Consequently, AOs are usually expressed</p>				
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<p>in the language of some computationally tractable sub logic of full firstorder logic (see, e.g., [6]). Such languages typically support:</p> <ul style="list-style-type: none"> <li>• Reasoning about classes and “slots” through the use of unary and (limited) binary predicates;</li> <li>• Conjunction and disjunction, but not negation;</li> </ul> <p><b>Philosophical inclination toward pragmatism/instrumentalism/constructivism</b></p> <p>Unlike the strong realism underlying ROs, for AOs, take a far more pragmatic view of the world, both metaphysically and epistemologically. Specifically, the metaphysical presumption underlying a typical AO is the falsity, or at least the irrelevance, of metaphysical realism. The objects and structures we encounter in the world — those parts of it that matter to ontology, anyway — are social constructs, products of the evolving interaction between conscious, intelligent human agents and, at best, a substrate of unknowable.</p> <p>The corresponding epistemological presumption is that, even if metaphysical realism is true and there is an ultimate metaphysical reality to the world, that underlying reality probably unknowable anyway. Hence, what we can be said to know is simply what works.</p> <p><b>Methodological emphasis on fidelity</b></p> <p>Methodologically, the central emphasis of an AO must be on fidelity, i.e., to be a faithful expression of the concepts/intuitions of relevant domain experts or sources. All that matters to an AO is how relevant domain experts conceptualize a given domain. The question of any sort correspondence between that conception and an objective external world is idle philosophical speculation with no bearing on the quality of the ontology, which is determined entirely by the extent of its fidelity.</p> <p>On the face of it, these two approaches two ontology are profoundly different. However, the starkest differences are philosophical; indeed, those differences are probably irreconcilable. However, important as those differences might be conceptually, at the end of the day what we are engaged in is knowledge engineering. And as engineers, I suggest the following tendentious</p>				
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(not to say controversial) thesis: the only components of the two approaches that ultimately matter are the theoretical and methodological. These, I will argue are compatible, indeed complementary.

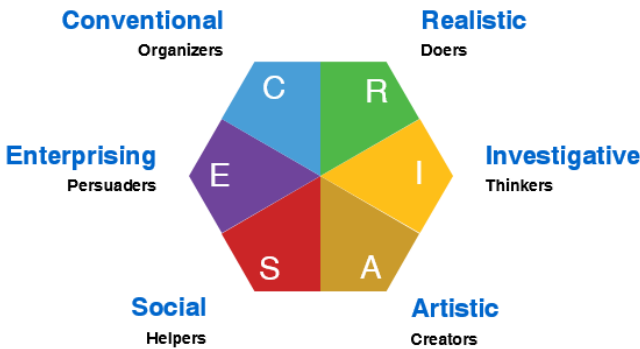
Reference ontology versus Application ontology

Reference Ontology	Application Ontology
theoretical Focus on representing	theoretical Focus on representing
establishes consensus about meaning of terms	offers terminological services for semantic access, checking constraints between terms
maximal coverage	provides a minimal terminological structure
Fits the needs of a large community	fits the needs of a specific community
Fits the needs of a large community	lightweight ontologies
Can't be derived from application ontology	can be derived from Reference ontology
broad and deep	broad and deep
designed according to strict ontological principles	designed according to the viewpoint of an end-user in a particular domain

### Reference ontology with regard to application ontology

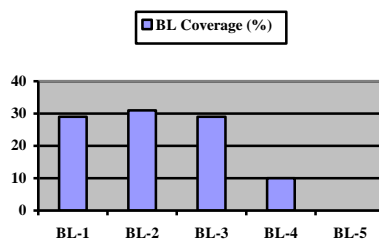
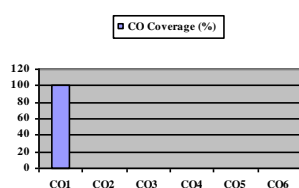
Application ontologies contain all the definitions that are needed to model the knowledge required for a particular application. They are not reusable themselves.

“Application ontologies describe concepts depending both on a particular domain and task, which are often specializations of both the related ontologies. These concepts often correspond to roles played by domain entities while performing

	a certain activity, like replaceable unit or spare component “.				
9b	 <p><b>Realistic - R (Doers)</b></p> <p>Like to work with their hands and focus on things in the physical world &amp; 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.</p> <p><b>Investigative - I (Thinkers)</b></p> <p>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.</p> <p><b>Artistic - A (Creators)</b></p> <p>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..</p>	12	3	CO3	4

	<p><b>Social - S (Helpers)</b></p> <p>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.</p> <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>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>				
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### 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	CO2	6	1		
2	CO2	1	1		
3	CO3	1	1		
4	CO3	1	1		
5	CO3	12	1		
Part- B (2 x 4= 8 Marks)					
6	CO2	1	4		
7	CO3	1	4		
8	CO2	1	4		
Part- C (1 x 12= 12 Marks)					
9a	CO2	12	12		
9b	CO3	4	12		

**Consolidated Marks:**

CO	Maximum Marks	Marks Obtained
1	25	
Total	25	

PO	Maximum Marks	Marks Obtained
1	15	
4	13	
12	13	
Total	41	

Signature of Course Teacher

Signature of the Course Coordinator

Signature of the Academic Advisor