Exam Date & Time: 19-May-2022 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

Instructions: Take one of the following projects
1. Railway gate
2. Rocket launch
3. Missile guidance and control
4. Bike speed control

Answer all the project-based question based on one of the projects. All answers should be for the selected project. DO NOT mix projects.

INTRODUCTION TO SYSTEM ENGINEERING [ICE 4073]

Marks: 50 **Duration: 180 mins.**

Descriptive

Answer all the questions. Section Duration: 180 mins

1)	Why do we say whole is not equal to sum of parts in the context of systems? Answer with an example.	(2)
2)	A system should have approximately ___ number of elements in it. What is the approximate number and why is it so?	(2)
3)	What are the characteristics of a system?	(2)
4)	What is MOE and MOP? Describe these two terms with an example from the project you have selected.	(4)
5)	Define these terms in one or two lines (a) system, (b) sub systems, (c) partial systems, and (d) system of systems.	(2)
6)	What is EARS notation? What are the types of requirements in EARS? Explain with emphasis on the keywords.	(3)
7)	For the project you have selected write down 10 requirements in the EARS notation. This could be combination of high level and low-level requirements. Strictly follow EARS syntax.	(5)
8)	What is STPA? What are Hazards? What are Safety Constraints? Answer with examples.	(2)
9)	What is HCS? Make an HCS for your specific project and explain it.	(3)
10)		(5)

What are UCA? What are the 4 types of UCA? Write down the UCA for your specific project. At least 2 for each block in your HCS.

11) Draw the V Model and define the processes in the left and right side. (2)

12) How will you map the V model processes to you project? Hint: I will start with CONOPS – explain what will you do in this phase for your project. Walk through the various processes and explain what are the outputs from these processes in the V mode pertaining to your project. (4)

13) Using the set of requirements for your project explain how you will test and validate these requirements. Do at least 4 requirements. (4)

14) Explain the terms (a) Physical Simulation, (b) Engineering Simulation, (c) Mission Simulation, and (d) Hardware in Loop Simulation (4)

15) Explain a hardware in loop setup for your selected project. What are the components you will use (4)

16) What are the differences between Schematic Models and Mathematical Models? (2)

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