Engineering Systems

All questions are compulsory **Duration: 90 mins**

Max Marks: 50

1. Consider these two systems - the transportation system of a city and the metro-rail network system. Explain the concepts of Closed and Open Systems based on these two systems. Also discuss whether you will use a bottom-up or top-down approach for these two systems. (5M)

2. Write a short note on system verification and validation (4M)

3. When one is tasked with design or analysis of a system, how important is it to characterize a system? Briefly explain 5 important attributes and/or characteristics of one of these systems - Electoral System; Communication System (5M)

4. Define degrees-of-freedom (DOF). How is it related to the number of actuators? It is required to control the position (X, Y, Z) of a camera centre, and its rotation about the Z axis. What would be the minimum DOF required to control the Camera? Conceptualize and draw schematic of the robot with minimum Required DOF for this task. Consider rotary (revolute) and translatory (prismatic) joints only. (5M)

5. What is the need to Engineer Large Systems? And what value does it bring in executing large engineering systems? (5M)

6. Explain system life cycle and various phases involved in it by considering developing game app as a system (5M)

7. Describe product life cycle, waterfall process model and 'V' lifecycle model with diagrams. (6M)

8. List out various stake holders and their roles of a print media along with it measures in various aspects. (5M)

9. It is required to design a robot for inspection of pipes with diameters in the range of 50-60cm. List required performance specification/design considerations for the robot. Conceptualize design of the robot and draw its schematic diagram. List and justify different subsystem required. (5M)

10. (a) Is university a workflow-based system or a complex system? Explain

    (b) What does one mean by Emergent properties? Briefly explain, using an appropriate example, how systems approach helps in identifying them. (5M)