DEPARTEMNT OF COMPUTER SCIENCE AND ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI-15.

CSPC61 – Embedded Systems Architecture

VI Semester - Section A / End Semester Examination

Time : 3 Hours **Answer ALL Questions** **Max. Marks : 50**
Date: 28/04/2025

1.a. List and explain at least five characteristics of embedded systems. (2)

b. What are the main components of an embedded system? (2)

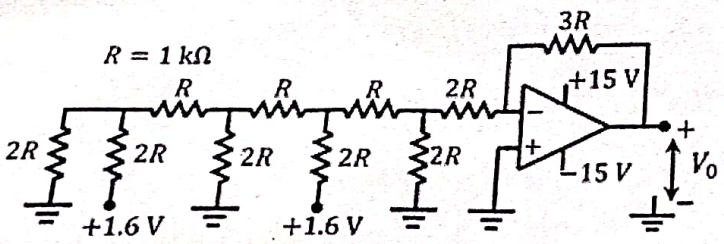
c. Differentiate between embedded systems and real-time systems. Can an embedded system be a real-time system? (3)

d. Classify embedded systems based on performance and functional requirements. Provide examples. (3)

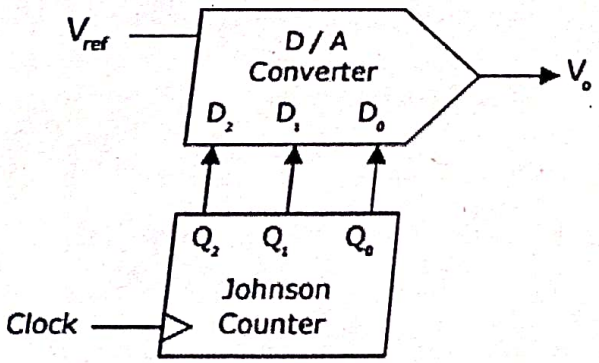
2.a. Explain the design and operation of the control path and data path in an embedded processor architecture. Illustrate with a block diagram and discuss how they work together to execute instructions like LOAD and ADD. (8)

b. Describe the typical life cycle of an embedded system – from development to deployment. (2)

3.a. Consider the circuit shown with an ideal OPAMP. Calculate the output voltage. (5)



b. *The output of a 3-stage Johnson (twisted ring) counter is fed to a digital-to analog (D/A) converter as shown in the figure below. Assume all the states of the counter to be unset initially. Draw the waveform which represents the D/A converter output vo.* (5)



1.a: *Consider the following tasks with their execution times and deadlines (equal to periods): Use* ***Earliest Deadline First (EDF)*** *to determine the order of execution of the tasks over the first 6 ms of the schedule.* (5)

Task	Execution Time (C)	Deadline (D)	Period (T)
T1	2 ms	4 ms	4 ms
T2	1 ms	3 ms	3 ms
T3	1 ms	6 ms	6 ms

b. You have the following set of tasks: Check whether the tasks are schedulable using **Rate-Monotonic Scheduling (RMA).** (5)

Task	Execution Time (C)	Period (T)
T1	3 ms	6 ms
T2	1 ms	4 ms
T3	2 ms	8ms

5,a. Which of Figures 1a, b, c, and d is incorrect in terms of mapping middleware software into the Embedded Systems Model? (2)

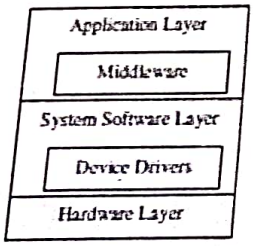


Fig 1. a.

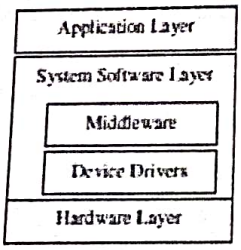


Fig 1. b.

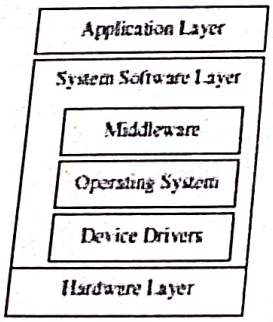


Fig 1.c.

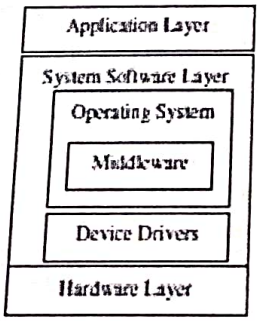


Fig 1.d.

b. What is the difference between a PPP state and a PPP event? List and describe three examples of each. (3)

c. What is application software? Where in the Embedded Systems Model is application software typically located? (3)

d. Draw the TCP/IP model layers relative to the OSI model. Which layer would TCP fall under? (2)