Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)
B.E. (Full Time) - END SEMESTER EXAMINATIONS, APRIL/MAY 2024
ELECTRONICS AND COMMUNICATION ENGINEERING
Elective
EC5077 - REAL TIME EMBEDDED SYSTEMS
(Regulation 2019)

Time: 3hrs Max.Marks: 100

CO1	Ability to design and develop ARM processor based systems.
CO2	Ability to comprehend and appreciate the significance and role of microcontrollers in embedded systems.
CO3	Ability to analyze and demonstrate program design and optimization and proper scheduling of the process.
CO4	Ability to apply the concept of process, multi-processes and operating systems in embedded system design.
CO5	Ability to implement various communication protocols in distributed embedded computing platform.

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)
(Answer all Questions)

Q.No	Questions	Marks	CO	BL
1	At what stage of the design methodology would we determine what type of CPU to be used in an Embedded system?	2	CO1	L1
2	Write the ARM instruction for performing a conditional subroutine call.	2	CO1	L2
3	Assume that a system has a two-level cache: The level 1 cache has a hit rate of 90% and the level 2 cache has a hit rate of 97%. The level 1 cache access time is 4 ns, the level 2 access time is 15 ns. What is the average memory access time?	2	CO2	L2
4	Draw a UML sequence diagram that shows a four-cycle handshake between a bus master and a device.	2	CO2	L1
5	Draw the CDFG for the given code fragment: x = 1; if (y == 2) { r = a + b; s = c - d; } else { r = a - c; }	2	CO3	L2
6	Mention the three different types of performance measures on programs.	2	CO3	L1
7	List out the various assumptions made in RMS algorithm.	2	CO4	L2
8	What is meant by a thread?	2	CO4	L1
9	Why accelerators are required in a multiprocessor environment?	2	CO5	L2
10	Mention the purpose of presentation layer in OSI model.	2	CO5	L1

PART- B(5x 13=65Marks)

Q.No	Questions	Marks	CO	BL
11.(a) (i)	Briefly discuss about the challenges faced while designing an Embedded System.	7	CO1	L3
(ii)	Implement peek( ) and poke( ) in assembly language for ARM processor.	6	CO1	L3
	OR			
11.(b)(i)	Write in detail about the various operating modes supported by the ARM processor.	7	CO1	L3
(ii)	Write an ARM assembly language program, which performs the basic convolution operation.	6	CO1	L3
		(P.T.O)		

12.(a) (i)	Taking suitable examples, explain about 'Traps' and 'Exceptions'.	7	CO2	L3
(ii)	Draw the UML state diagram of bus bridge operation and explain.	6	CO2	L3
	OR			
12.(b) (i)	With neat sketches, explain in detail about the address translation procedure for a segment and for a page.	7	CO2	L3
(ii)	Draw the internal structure of a counter/timer and explain how operational wise they differ from each other.	6	CO2	L3
13.(a)(i)	Write a brief note on the methods used for optimizing the software.	7	CO3	L3
(ii)	Briefly discuss about the different techniques used for program validation using black box testing.	6	CO3	L3
	OR			
13.(b)	With neat diagram, briefly discuss the various stages a program needs to undergo before being executed.	13	CO3	L3
14.(a)	With neat sketches, briefly explain about the various methods used for performing interprocess communication.	13	CO4	L4
	OR			
14.(b)	For the periodic process given below, use EDF algorithm to schedule the processes and compute the schedule for an interval equal to the hyperperiod of the processes.Time starts at t=0. Process / CPU time / Deadline P1 / 1 / 3 P2 / 1 / 4 P3 / 2 / 8	13	CO4	L4
15.(a) (i)	By taking a relevant example, compute the performance analysis of a system built in a multiprocessor environment.	7	CO5	L4
(ii)	Briefly discuss about the protocol utilization in Internet communication.	6	CO5	L4
	OR			
15.(b)	With neat diagram, briefly explain about the CAN protocol and how CAN bus is being used for data communication.	13	CO5	L4

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No	Questions	Marks	CO	BL
16.	With neat sketches, explain the detailed design procedure and working of a controller mechanism used in multilevel car parking system.	15	CO5	L6