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PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations - March 2026

Date: 11-03- 2026

Time: 11.45am to 01.15pm

School: SOE	Program: B. Tech		
Course Code : ECE2521	Course Name: Embedded Systems Design Using Microcontroller		
Semester: IV	Max Marks: 50	Weightage: 25%	

CO - Levels	C01	C02	C03	C04	C05
Marks	26	24			

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.

5Q x 2M=10M

1	Quality attributes are the set of system functional and non-functional requirements that are used to evaluate the system performance. Define the following Operational quality attributes of the Embedded System. a) Throughput b) Reliability	2 Marks	L1	C01
2	Program Status Registers (PSR) is a special register to monitor and to control the internal operations. List the 8 bits available in the CPSR.	2 Marks	L1	C01
3	The two common architecture models of Microcontroller are Harvard Architecture and von-Neumann architecture. Compare Harvard Architecture and von-Neumann architecture.	2 Marks	L1	C01
4	State the operation of MRS and MSR instructions with its significance.	2 Marks	L1	C02
5	The CMP instruction can be used to compare two numbers. Illustrate the working of compare instruction.	2 Marks	L1	C02

Part B

Answer the Questions.

Total Marks 40M

6.	a.	With the aid of a detailed block diagram, describe the architecture of ARM based embedded systems with microcontroller. Explain the function of each core component.	10 Marks	L3	C01
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	b.	Describe the role of the following in an ARM processor: General Purpose Registers, CPSR, and the Pipeline. Explain with an example how the CPSR flags are affected by a simple arithmetic operation.	10 Marks	L3	CO1
Or					
7.	a.	Explain the quality attributes of an embedded system. Discuss any five important quality attributes with suitable examples.	10 Marks	L3	CO1
	b.	Describe the interrupt execution sequence in an embedded system. Explain how the processor saves context, services the interrupt, and resumes normal program execution.	10 Marks	L3	CO1

8.	a.	For each of the following instructions (a) Name the addressing modes available in the ARM Processor and (b) the output for each of the instructions when they are executed. The initial values are given as R1= 0x25397691, R2= 0x6354E1F5, and R3= 0x63A65DBC. a) AND R0, R1, R2 LSR R3 b) STR R3, [R2 LSR#4] c) STR R2, [R3] d) LDR R6, [R1], #4 e) Mention the operation of LDMIA R6!, {R2- R4} instruction.	15 Marks	L3	CO2
	b.	Monthly income of four people in a family are \$3000h, \$3500h, \$4000h & \$5000h. Write an ALP using ARM instructions to find the total income of the family.	5 Marks	L3	CO2

Or					
9.	a.	The initial values of the registers in the following instructions are given as R1 = 0x55446677, R2 = 0x12345678 & R3 = 0xFFFFFFFF. Indicate the output for each of the following instructions when they are executed: a) MOVS R0, R1 LSL #1 b) ADD R0, R1, R1 LSL #1 c) BEQ Label d) SWP R0, R1, [R2] e) UMULL R0, R1, R2, R3	15 Marks	L3	CO2
	b.	Consider two 16-bit data that are stored in two different registers of ARM Processor. It is required to perform addition between them. Write an ALP using ARM instruction to perform 16 bit addition on these two numbers.	5 Marks	L3	CO2