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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S8 (S, FE) / S8 (PT) (R, S) Examination June 2023 (2015 Scheme)

Course Code: CS404

Course Name: Embedded Systems

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 4 marks. Marks

1	List and explain two functional and non-functional requirements of a digital camera.	(4)
2	Write any four applications of embedded systems with an example for each.	(4)
3	Explain Data Flow Graph/Diagram(DFGs) with an example. Which type of embedded applications are best modelled using DFGs? When do we say that a DFG model is acyclic?	(4)
4	What are cross compilers? What are their role in embedded system design?	(4)
5	Which are the different task states supported by MicroC-OS/II? How are task stacks designed in MicroC-OS/II to optimize RAM utilization?	(4)
6	Differentiate between In System Programming (ISP) and In Application Programming (IAP).	(4)
7	Differentiate between Co-operative Multitasking and Non-Preemptive Multitasking.	(4)
8	What are monolithic and micro kernels? Give an example for each.	(4)
9	How can you control access to a shared bus in a distributed embedded system?	(4)
10	List and explain the important tasks performed during the Deployment Phase of an embedded product.	(4)

PART B

Answer any two full questions, each carries 9 marks.

11	a)	Suppose you are designing a smart watch. Give any three constraints that are to be considered while designing this product. Give one method each that can be adopted to meet these constraints.	(5)
	b)	Draw a "control data flow graph" (CFDG) for the following requirements. if flag = 1, x = a + b ; else y = a - b	(4)

12 a) Imagine yourself as an Embedded System developer. A client approached your team to make an automated door opening/closing system for their shop. Develop requirements description of the system. (3)

b) Draw the Finite State Machine diagram for the above automated door opening/closing system. (6)

13 a) Illustrate the embedded system design process with a neat diagram. (4)

b) Draw a sequential program model flowchart for Seat Belt Warning System of an automobile. Also illustrate it with a program in C programming language. (5)

PART C

Answer any two full questions, each carries 9 marks.

14 a) Explain the super loop based approach in embedded firmware design with suitable example. Also list the advantages and disadvantages of the super loop based approach. (6)

b) What are library files? How are they useful in firmware development? (3)

15 a) Illustrate the In Circuit Emulator (ICE) based firmware debugging setup with a neat diagram and explain each component in it. (6)

b) Identify the technique to be used for studying the inner workings of a proprietary product. Also explain the tools which can be used for this. (3)

16 a) Name and explain the four fields present in a line of code written in assembly language. (4)

b) Explain the terms (i) Simulator (ii) Emulator (5)

PART D

Answer any two full questions. each carries 12 marks.

17 a) Explain how interrupts are handled in an RTOS with two levels of interrupt service routines. What is the advantage of this approach when compared to the other approaches used in RTOS interrupt handling? (6)

b) What is the difference between hard and soft RTOS? What are the important functional and non-functional requirements that needs to be analysed in the selection of an RTOS for an embedded design? (6)

18 a) Explain the working of the I^2C bus with a neat diagram. (6)

b) State and explain the three primary objectives of Embedded Product Development Life Cycle (EDLC). (6)

19 a) Three processes with process IDs P1, P2, P3 and with estimated completion times 4, 16, 12 milliseconds respectively, enter the ready queue together in the (6)

same order. Process P4 with an estimated execution completion time 8 milliseconds enters the ready queue after 2 milliseconds. (Assuming there is no I/O waiting for the processes) in non-preemptive Shortest Job First (SJF) scheduling algorithm. Calculate the waiting time and Turn Around Time for all the four processes. Also find the average waiting time and turn around time.

b) Explain various types of testing performed in Embedded product development. (6)

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