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Reg No.:_____

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# APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
## EIGHTH SEMESTER B.TECH DEGREE EXAMINATION, MAY 2019
### Course Code: CS404
### Course Name: Embedded Systems

Max. Marks: 100

Duration: 3 Hours

## PART A
### *Answer all questions, each carries 4 marks.*

Marks

| | | |
|---|---|---|
| 1 | What is an embedded computing system? Write two functionalities of an embedded system. | (4) |
| 2 | Explain the problems of hardware software co-design in an embedded system. | (4) |
| 3 | Draw a concurrent program model for Seat Belt Warning System of an automobile. | (4) |
| 4 | Explain the library file in assembly language context. What is the benefit of 'library file'. | (4) |
| 5 | Briefly describe out of circuit programming in Embedded System. | (4) |
| 6 | Differentiate generic IDEs with IDEs used in embedded firmware development with suitable examples. | (4) |
| 7 | Explain hard real-time considerations and soft real-time considerations | (4) |
| 8 | Differentiate monolithic kernel with microkernel | (4) |
| 9 | Explain System on Chip technique (SOC) | (4) |
| 10 | Write any 4 bottlenecks available in the embedded industry. | (4) |

## PART B
### *Answer any two full questions, each carries 9 marks.*

11  a) With a suitable example, explain the specification phase of an embedded (5)
system.

b) Show the UML representation of an object and a class with a suitable example. (4)

12  a) Design a coin operated public telephone unit based on FSM model for the (9)
following requirements.

1. The calling process is initiated by lifting the receiver (off-hook) of the telephone unit.

2. After lifting the phone the user needs to insert a 1 rupee coin to make the call.

3. If the line is busy, the coin is returned on placing the receiver back on the hook (on-hook).

4. If the line is through, the user is allowed to talk till 60 seconds and at the end of 45th second, prompt for inserting another one rupee coin for continuing the call is initiated.

5. If the user doesn't insert another 1 rupee coin, the call is terminated on completing the 60 seconds time slot.

6. The system is ready to accept new call request when the receiver is placed back on the hook (on-hook).

7. The system goes to the "Out of Order" state when there is a line fault.

*(No need to take care of the scenarios like user doesn't insert a coin within the specified time after lifting the receiver, user inserts coins other than a one rupee etc.)*

13  a)  List and explain the non functional requirements in an embedded system. (4)

b)  Draw a class diagram for a basic microwave oven, cooking time should be adjusted from 1 min to 60 min. Include classes for door, front panel and heating elements. (5)

## PART C
### *Answer any two full questions, each carries 9 marks.*

14  a)  With a neat diagram explain the steps in converting assembly language to machine language (9)

15  a)  Explain the Debuggers used in Embedded System Development Environment (5)

b)  Briefly describe (i) decompiler (4)

(ii) disassemblers

16  a)  Is it possible to embed the firmware into the target processor/controller memory at the time of chip fabrication? Justify your answer. (3)

b)  Explain the merits and demerits of assembly language based embedded firmware development . (6)

## PART D
### *Answer any two full questions, each carries 12 marks.*

17  Explain the different types of Inter Task Communication mechanisms supported by MicroC/OS-II kernel. (12)

18  (a)  Explain the various steps involved in the development of an embedded system (5)

using Waterfall model.

(b) Explain the need for product Re-engineering in embedded product development.  (4)

(c) What are the factors that lead to the disposal of an embedded product.  (3)

19 a) Consider a mobile phone device and look at the main menu. Explain how the events of touching the screen at different points on the screen are handled by an RTOS using two-level ISR handling.  (6)

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

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