KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Sixth Semester

MECHATRONICS ENGINEERING

U15MCT601: Microcontroller and Embedded Systems

COURSE OUTCOMES

CO1: Differentiate microcontroller from microprocessor and explain the general architecture of microcontrollers

CO2: Explain the applications of micro controllers and differentiate few microcontroller cores based on their construction and applications

CO3: Summarize the memory organization and internal communication of 8051 and PIC micro controller.

CO4: Program, 8051 using different addressing modes and effectively use the timers, counters and interrupts for a given application

CO5: Describe the architecture of real time operating systems with inter task communication

CO6: Design embedded system scheme for few real time domestic, auto and space applications

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 1 = 10 Marks)

1. Matching type item with multiple choice code   CO1 [K$_2$]

List I	List II
A. SoC	i. Logic Analyzer
B. Monitoring	ii. RISC
C. Harvard architecture	iii. Fourth generation
D. Embedded System	iv. ARM

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	ii	iv	iii	i
d)	iii	i	ii	iv

2. Which of the following in one-time programmable memory?   CO3   [K$_2$]

a)   SRAM   b)   PROM

c)   FLASH   d)   NVRAM

3. The following features are applicable to 8051 microcontroller: CO3 [K2]

    1. Word length is 16 bits.

    2. Harvard architecture.

    3. Signed arithmetic operations.

    4. A/D conversion available on chip.

a) 1,3   b) 1,4

c) 1,2   d) 2,3

4. When using serial communication in 8051 at a baud rate of 4800, the following number has to be loaded in TH1: CO4 [K2]

a) -6   b) +6

c) FA   d) -FA

5. Assertion (A): Timers of 8051 can be alternatively used as counters. CO2 [K2]

Reason (R): Counters count external pulses.

a) Both A and R are Individually true and R is the correct explanation of A   b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false   d) A is false but R is true

6. The register that allows the PIC microcontroller memory space to be expanded from 2K to 8K is: CO3 [K2]

a) Program Counter   b) RP0

c) INDF   d) PCLATH

7. The following sequence of instructions generates nested delay in PIC microcontroller: CO4 [K3]

LOOP

    1. decfsz COUNTL, F

    2. decfsz COUNTH, F

    3. goto LOOP

    4. goto LOOP

    5. return

a) 2-3-4-1   b) 1-3-2-4

c) 3-4-2-1   d) 4-1-3-2

8. The part of RTOS that keeps track of each task and its state is CO5 [K2]

a) Kernel   b) Task manager

c) Scheduler   d) ISR

9. Assertion (A): Reset of an embedded system generates a non-maskable interrupt.   CO5 [K$_2$]

   Reason (R): Reset stabilizes the embedded system.

   a) Both A and R are Individually true and   b) Both A and R are Individually true but
      R is the correct explanation of A   R is not the correct explanation of A

   c) A is true but R is false   d) A is false but R is true

10. The system that maintains the speed of a car constant is   CO6 [K$_2$]

    a) Embedded system   b) Cruise control

    c) Real-time control   d) 8051 micrcontroller

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11. Differentiate between Little-Endian and Big-Endian controllers.   CO1 [K$_2$]

12. Express the number 436$_d$ in packed and unpacked BCD format, assuming byte sized memory.   CO2 [K$_2$]

13. Which bits in which registers must be set to give serial data interrupt the highest priority?   CO3 [K$_2$]

14. Write 8051 instructions that send the ASCII code for A on Port 0 and ASCII code for B on Port 1.   CO4 [K$_3$]

15. Move the data 42H from accumulator to memory location 42H using indirect addressing.   CO4 [K$_3$]

16. What is instruction pipelining?   CO3 [K$_2$]

17. What is the function of watchdog timer in PIC microcontroller?   CO3 [K$_2$]

18. Enumerate the three states in which a task in RTOS can exist.   CO5 [K$_2$]

19. How do pointers and queue facilitate interface to RTOS?   CO5 [K$_2$]

20. What is ABS?   CO6 [K$_2$]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. i) Describe the architecture of 8051 microcontroller with neat block diagram.   (10)   CO1 [K$_2$]

    ii) Enumerate the characteristic features of 8051.   (4)

22. i) Explain the different classification of embedded systems with an example each.   (10)   CO2 [K$_2$]

    ii) Enumerate any four application areas of embedded systems.   (4)

23. With a neat schematic, explain how program and data memory (internal and external) is interfaced to 8051 microcontroller.   CO3 [K$_3$]

24. i) Write an assembly language program to generate a square wave of frequency 1 kHz (10) CO4 [K₃] on P1.2 continuously. Assume clock frequency of 11.0592 MHz.

ii) Explain the four addressing modes of 8051 with an example each. (4) [K₂]

25. Explain the architecture and peripherals of PIC microcontroller with necessary diagrams. CO3 [K₂]

26. i) Describe how semaphores are used by RTOS to take care of shared data problems. (10) CO5 [K₂]

ii) Write a note on handheld operating systems. (4)

27. Explain how an automatic washing machine is designed using an embedded system. CO6 [K₃]

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