**University of Mumbai**

**Examinations Summer 2022**

Program: Electronic & Telecommunication Engineering

SEM-IV (C Scheme) (R2019)

Subject: Microcontroller Course Code: ECC402

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| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
| 1. | How can we change the speed of a DC motor using PWM in PIC 16F886 microcontroller? |
| Option A: | By changing amplitude of Pulse |
| Option B: | By keeping fixed duty cycle |
| Option C: | By changing duty cycle |
| Option D: | By increasing power of Pulse |
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| 2. | The high speed memory between the CPU and main memory is called as------- |
| Option A: | Cache Memory |
| Option B: | Virtual memory |
| Option C: | Secondary memory |
| Option D: | Storage memory |
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| 3. | The registers that provide control and status information about Timer/Counters in 8051 is --------. |
| Option A: | IP, IE |
| Option B: | TMOD, TCON |
| Option C: | SCON, SBUF |
| Option D: | Flag register, Accumulator |
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| 4. | The higher and lower bytes of a 16-bit register DPTR in 8051 are represented respectively as |
| Option A: | LDPTR and HDPTR |
| Option B: | DPTRL and DPTRH |
| Option C: | DPH and DPL |
| Option D: | HDP and LDP |
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| 5. | What is the function of a watchdog timer (WDT)? |
| Option A: | It resets the system if applied voltage increased above threshold value |
| Option B: | It resets the system if applied voltage decreases below threshold value |
| Option C: | It resets the system if the software fails to operate properly. |
| Option D: | It resets the system if Power failure is detected. |
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| 6. | In the instruction “MOV TH1, #-3”, what is the value that is being loaded in the TH1 register? |
| Option A: | FCH |
| Option B: | FBH |
| Option C: | FDH |
| Option D: | FEH |
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| 7. | How much flash memory does the Atmega328 have? |
| Option A: | 13K bytes |
| Option B: | 32K bytes |
| Option C: | 256K bytes |
| Option D: | 16K bytes |
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| 8. | Which of the following are pipelining stages of ARM7? |
| Option A: | Fetch, Decode, Write |
| Option B: | Fetch, Decode, Execute, Write |
| Option C: | Fetch, Execute, Write |
| Option D: | Fetch, Decode, Execute |
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| 9. | Which of the following register of ARM7 is used as Program Counter? |
| Option A: | CPSR |
| Option B: | SPSR |
| Option C: | R14 |
| Option D: | R15 |
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| 10. | Which of the following tool convert assembly language program into Machine language program. |
| Option A: | Assembler |
| Option B: | Converter |
| Option C: | Compiler |
| Option D: | Interpreter |

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| 11. | Program Counter of CPU --------. |
| Option A: | Holds address of the next instruction to be executed from memory. |
| Option B: | Personal Computer |
| Option C: | Holds frequently used data. |
| Option D: | Holds frequently used instructions. |
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| 12. | How many address lines a memory chip of 64K capacity will have? |
| Option A: | 16 |
| Option B: | 64 |
| Option C: | 15 |
| Option D: | 6 |
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| 13. | Which of the following is not control signal of memory? |
| Option A: | Write (WR) |
| Option B: | Data bus (D7-D0) |
| Option C: | Chip Select (CS) |
| Option D: | Read (RD) |
|  |  |
| 14. | What is DMA? |
| Option A: | It allows to store data in stack memory |
| Option B: | It allows to store data in virtual memory |
| Option C: | DMA allow IO devices to access/retrieve data directly from the main memory |
| Option D: | It allows to store data in cache memory |
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| 15. | Which of the following is not semiconductor memory? |
| Option A: | Static Random-Access-Memory (SRAM) |
| Option B: | Dynamic Random-Access-Memory (SRAM) |
| Option C: | Flash Memory |
| Option D: | Magnetic Tape |
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| 16. | Which of the following memory needs refreshing circuit? |
| Option A: | DRAM |
| Option B: | SRAM |
| Option C: | Flash Memory |
| Option D: | NVRAM |
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| 17. | When a program tries to access a page that is mapped in address space but not loaded in physical memory, then ----. |
| Option A: | Page fault occurs |
| Option B: | Fatal error occurs |
| Option C: | No error occurs |
| Option D: | Segmentation fault occurs |
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| 18. | ------- port of 8051 is a multifunctioning port. |
| Option A: | P0 |
| Option B: | P1 |
| Option C: | P2 |
| Option D: | P3 |
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| 19. | Mode-1 of timer-0 in 8051 works with ------ bits |
| Option A: | 13 bits |
| Option B: | 8 bits |
| Option C: | 16 bits |
| Option D: | 32 bits |
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| 20. | RS1-RS0 bits of program status word (PSW) are 01. R1 register of selected bank refers to ------- memory location. |
| Option A: | 19H |
| Option B: | 11H |
| Option C: | 01H |
| Option D: | 09H |

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| 21. | Which of the following register of 8051 is used to hold 16 bits address? |
| Option A: | Program status Word (PSW) |
| Option B: | TMOD |
| Option C: | DPTR |
| Option D: | SCON |
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| 22. | How much internal RAM is available for user in 8051? |
| Option A: | 256B |
| Option B: | 128KB |
| Option C: | 256KB |
| Option D: | 128B |
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| 23. | ------ is not a standard baud rate supported for serial communication? |
| Option A: | 9600Kbps |
| Option B: | 2400 bps |
| Option C: | 4800 bps |
| Option D: | 1200 bps |
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| 24. | MOV A, @R1 instruction |
| Option A: | Move contents of R1 into ACC |
| Option B: | Move ASCII of R1 into ACC |
| Option C: | Move contents of ACC into R1 |
| Option D: | Move contents of RAM whose address is held by R1 into ACC |
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| 25. | MOV A, #12H  MOV B, #04H  DIV AB  After executing above set of instructions, A = ---- and B = ----. |
| Option A: | A = 3 and B = 4 |
| Option B: | A = 0 and B = 0 |
| Option C: | A = 3 and B = 0 |
| Option D: | A = 4 and B = 2 |
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| 26. | 8051 based system is working with 11.059MHz crystal frequency. Calculate number of machine cycles required to execute following set of instructions.  MOV R3, #200  HERE: DJNZ R3, HERE  RET |
| Option A: | 403 |
| Option B: | 200 |
| Option C: | 202 |
| Option D: | 400 |
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| 27. | During serial communication, the data available in ------- register will be sent to outside world through TX pin of 8051 micro-controller. |
| Option A: | Accumulator (A) |
| Option B: | SBUF |
| Option C: | SCON |
| Option D: | TCON |
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| 28. | How many GPIO pin of 8051 are needed to interface 4x3 matrix keypad? |
| Option A: | 12 |
| Option B: | 8 |
| Option C: | 7 |
| Option D: | 16 |
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| 29. | Due to RISC based architecture, ARM7 takes ----- cycle to effectively execute an instruction. |
| Option A: | 3 |
| Option B: | 5 |
| Option C: | 12 |
| Option D: | 1 |
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| 30. | Which Cortex core is suitable for anti-lock braking (ABS) system of vehicle application? |
| Option A: | Cortex-A |
| Option B: | Cortex-R |
| Option C: | Cortex-M |
| Option D: | Cortex-B |

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| 31. | LDR R0, [R1] instruction of ARM --------------. |
| Option A: | Load contents of memory, whose address is held by R1 into R0. |
| Option B: | Load contents of R1 into R0 |
| Option C: | Load contents of R0 into R1 |
| Option D: | Load contents of R0 into memory, whose address is held by R1. |
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| 32. | Which of the following mode of ARM is used, when the processor encounters an instruction that is undefined or not supported by the implementation? |
| Option A: | System Mode |
| Option B: | Supervisory Mode |
| Option C: | Undefined Mode |
| Option D: | User Mode |
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| 33. | Which of the following register in ARM is used to store return address of subroutine? |
| Option A: | R0 |
| Option B: | R13 |
| Option C: | R15 |
| Option D: | R14 |
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| 34. | Thumb instructions of ARM consists of ------- bits. |
| Option A: | 16 |
| Option B: | 8 |
| Option C: | 64 |
| Option D: | 32 |
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| 35. | What is meant by R0 to R12 registers of ARM are orthogonal. |
| Option A: | Addition of all the registers is zero |
| Option B: | Instruction apply to R0 can equally applicable to R12. |
| Option C: | Product of any two register is zero |
| Option D: | All registers are out of phase. |
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| 36. | Which of the following is not supported by RISC architecture |
| Option A: | Length of all instructions is same |
| Option B: | Pipeline of execution |
| Option C: | Greater Complexity in hardware |
| Option D: | Reduced instruction set |
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| 37. | ADD A, 20H of 8051 store result in Accumulator after performing following operation. |
| Option A: | add contents of accumulator with immediate data 20H |
| Option B: | is invalid instruction |
| Option C: | perform logical AND operation with 20H |
| Option D: | data from location 20H added with Accumulator |
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| 38. | How much on chip flash memory is available in 89V51RD2 micro-controller? |
| Option A: | 64Kbytes |
| Option B: | 32Kbytes |
| Option C: | 16KBytes |
| Option D: | 1Kbytes |
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| 39. | 10 bit, ADC is available in ATMEGA328P. Suppose VREF = 5V is connected to microcontroller and Analog voltage in 3V, Calculate decimal equivalent of output signal. |
| Option A: | 53 |
| Option B: | 614 |
| Option C: | 512 |
| Option D: | 256 |
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| 40. | Which of the following is not criteria to choose microcontroller in embedded system? |
| Option A: | Speed of the operation |
| Option B: | Microcontroller architecture |
| Option C: | Aesthetic of system |
| Option D: | Power consumption |

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| **Sr. No.** | **Q.1 or Q2 or Q3 5 marks each** |
| 1 | Compare SRAM and DRAM memory |
| 2 | Explain Direct cache mapping in microprocessor-based system. |
| 3 | Explain primary and secondary memory in brief. |
| 4 | Classify memory based on data retention capabilities. |
| 5 | Compare CISC and RISC processor’s architecture. |
| 6 | Compare Harvard and Von Neumann architecture of microprocessor. |
| 7 | Explain microcomputer based system in brief. |
| 8 | Write features of 89V51, ATMEGA 328P microcontroller. A Microcontroller based embedded system is to be developed with 10 bit ADC, SPI serial interface, comparator and 1 KB of EPROM. Select suitable microcontroller for the same. |
| 9 | Develop Embedded System for Real Time Clock using I2C. |
| 10 | Develop microcontroller based system to control speed of DC motor with the help of variable resistor. |
| 11 | Develop a system to read temperature in hall and display it on the LCD. |
| 12 | Compare Microprocessor and Microcontroller. |
| 13 | Draw and explain internal pin structure of P3 Port. |
| 14 | Draw and Explain Memory organization of 8051. |
| 15 | Explain TMOD register of 8051. |
| 16 | Explain Program Status Word (PSW) register of 8051. |
| 17 | Explain the concept of pipeline of ARM 7. |
| 18 | Explain Data processing, Data Transfer, Control flow with the help of example. |
| 19 | Explain Current Program Status Register of ARM7. |
| 20 | Compare instructions ACALL and LCALL of 8051. |
| 21 | Explain Assembler directive with the help of Examples. |

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| **Sr. No.** | **Q.1 or Q2 or Q3 10 marks each** |
| 1 | Develop an assembly language program for 8051 microcontroller to generate square waveform of 500Hz & 50% duty cycle at pin P3.4. Assume 8051 is operating at frequency 12 MHz. Use hardware timer 0 in mode 1 to generate delay. |
| 2 | Develop assembly program of 8051 to perform following task.   1. Load hexadecimal number 98 in R1 of bank-1 register. Write assembly language program to transfer data from R1 of bank-1 to R1 register of bank-2. 2. Load hexadecimal number 98 in R1 of bank-1 register. Write assembly language program to transfer this data from R1 of Bank-1 to external memory location 0500H. |
| 3 | Explain SCON register of 8051. Determine Hexadecimal number to be loaded in SCON register to configure UART of 8051 to receive and transmit 8 bits with variable baud rate data. |
| 4 | Explain Cortex-A, Cortex-B and Cortex-C ARM Core. Select appropriate Cortex core to develop embedded system which enable various advance electronics feature in vehicle. |
| 5 | Explain three stage pipelines of ARM7. Determine number of cycles required to execute 10 instructions of ARM7 program. |
| 6 | A switch button and relay module are interfaced with 8051 microcontroller. Write assembly language program to turn ON relay if Switch button is pressed, otherwise Relay will remains OFF. |
| 7 | Write assembly language program to send “---Mumbai University---” string from microcontroller 8051 to outside world with 9600bps baud rate. |
| 8 | LCD 16x2 is interface with 8051. Write assembly language program to display “LCD” on screen. |
| 9 | A system is to be developed with the help of 89V51RD2, RTC and Seven segment display to display time. Explain above embedded system with the help of interfacing diagram. |
| 10 | What are the selection criteria to choose appropriate microcontroller to the embedded systems? |
| 11 | Explain Virtual memory concept with memory management. |
| 12 | Suppose five 8 bit numbers are stored from code memory location 500H onward. Find smallest number among them and store the result in accumulator |
| 13 | A LED is interface with 8051 at P1.1 pin. 8051 is operating at 11.059MHz. Develop assembly language program to blink this LED with 1 second interval. |
| 14 | Explain Interrupt of ARM7 with its vector table. |
| 15 | Explain Interrupt of 8051. |
| 16 | Explain ARM core data flow model. |
| 17 | Explain all operating modes of ARM7. |
| 18 | Explain timers of 8051 with the help of logical diagram. |
| 19 | Explain a system which consists of Processor, L1 cache. L2 cache, Main memory and Secondary memory. |
| 20 | Explain features of ARM7. |

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Answer Key

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| **Question Number** | **Correct Option**  **(Enter either ‘A’ or ‘B’ or ‘C’ or ‘D’)** |
| Q1. | C |
| Q2. | A |
| Q3. | B |
| Q4 | C |
| Q5 | C |
| Q6 | C |
| Q7 | B |
| Q8. | D |
| Q9. | D |
| Q10. | A |
| Q11 | A |
| Q12 | A |
| Q13 | B |
| Q14 | C |
| Q15 | D |
| Q16 | A |
| Q17 | A |
| Q18 | D |
| Q19 | C |
| Q20 | D |

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| --- | --- |
| **Question Number** | **Correct Option**  **(Enter either ‘A’ or ‘B’ or ‘C’ or ‘D’)** |
| Q21. | C |
| Q22. | D |
| Q23. | A |
| Q24 | D |
| Q25 | D |
| Q26 | A |
| Q27 | B |
| Q28. | C |
| Q29. | D |
| Q20. | B |
| Q31 | A |
| Q32 | C |
| Q33 | D |
| Q34 | A |
| Q35 | B |
| Q36 | C |
| Q37 | D |
| Q38 | A |
| Q39 | B |
| Q40 | C |