

- 001.** If at a time A_0 and BHE (active low) both are zero then, the chip(s) selected will be **C**
 A RAM B ROM
 C RAM and ROM D ONLY RAM
- 002.** How many pins does the 8255 PPI IC contains? **D**
 A 24 B 20
 C 32 D 40
- 003.** In which mode do all the Ports of the 8255 PPI work as Input-Output units for data transfer? **B**
 A BSR mode B Mode 0 of I/O mode
 C Mode 1 of I/O mode D Mode 2 of I/O mode
- 004.** How many bits of data can be transferred between the 8255 PPI and the interfaced device at a time? or What is the size of internal bus of the 8255 PPI? **C**
 A 16 bits B 12 bits
 C 8 bits D 32 bits
- 005.** To obtain 16-bit data bus width, the two 4K*8 chips of RAM and ROM are arranged in **A**
 A parallel B serial
 C both serial and parallel D neither serial nor parallel
- 006.** If (address line) $A_0=0$ then, the status of address and memory are **C**
 A address is even and memory is in ROM B address is odd and memory is in ROM
 C address is even and memory is in RAM D address is odd and memory is in RAM
- 007.** The semiconductor memories are organized as _____ dimension(s) of array of memory locations. **B**
 A one dimensional B two dimensional
 C three dimensional D four dimensional
- 008.** To address a memory location out of N memory locations, the number of address lines required is **A**
 A $\log N$ (to the base 2) B $\log N$ (to the base 10)
 C $\log N$ (to the base e) D $\log (2N)$ (to the base e)
- 009.** Port C of 8255 can function independently as **C**
 A input port B output port
 C either input or output ports D both input and output ports
- 010.** All the functions of the ports of 8255 are achieved by programming the bits of an internal register called **C**
 A data bus control B read logic control
 C control word register D none of the mentioned
- 011.** The data bus buffer is controlled by **B**
 A control word register B read/write control logic
 C data bus D none of the mentioned
- 012.** The port that is used for the generation of handshake lines in mode 1 or mode 2 is **D**
 A port A B port B
 C port C Lower D port C Upper
- 013.** In which of the following modes we do not consider the D6, D5 and D4 bits of the control word? **A**
 A BSR mode B Mode 0 of I/O mode
 C Mode 1 of I/O mode D Mode 2 of I/O mode
- 014.** How many data lines in total are there in the 8255 PPI IC? **C**
 A 8 data lines B 32 data lines
 C 24 data lines D None of the above
- 015.** In which of the following modes is the 8255 PPI capable of transferring data while handshaking with the interfaced device? **C**
 A BSR mode B Mode 0 of I/O mode

- C Mode 1 of I/O mode D Mode 2 of I/O mode
- 016.** In which of the following modes of the 8255 PPI, only port C is taken into consideration? **A**
 A BSR mode B Mode 0 of I/O mode
 C Mode 1 of I/O mode D Mode 2 of I/O mode
- 017.** In 8251, Modem Control Block performs_____. **C**
 A Read and write operation B Converts Parallel data to serial format
 C communication between Modem and D for reset operation
 USART
- 018.** In 8251, _____ signal indicates to the CPU that internal circuit of the transmitter is ready to accept a new character for transmission from the CPU. **B**
 A RXREADY B TXREADY
 C DSR D CTS
- 019.** In 8251, RxD is a_____ pin. **A**
 A Input B Output
 C Input or Output pin D no such pin exists
- 020.** In 8251, two control words are present. What are they? **A**
 A Mode Instruction control word and command instruction control word B modem control word and command instruction control word
 C Mode Instruction control word and stack instruction control word D Mode Instruction control word only
- 021.** In 8086 microprocessor the following has the highest priority among all type interrupts. **A**
 A NMI B DIV 0
 C TYPE 255 D OVER FLOW
- 022.** In 8251, Transmit buffer block performs_____. **B**
 A Converts serial data to Parallel format B Converts Parallel data to serial format
 C reading operation D for receiving data
- 023.** What is the purpose of blanking (BI) associated with the 7-segment display operations? **A**
 A. To turn ON the display B. To turn OFF the display C. To pulse modulate the brightness of display D. To pulse modulate the lightness of display
 A B & C B A & D
 C A & B D C & D
- 024.** What does the RAM location at 44H indicates about the 7-segment code? **A**
 A 7-segment code for the third character B 7-segment code for the fourth character
 C Display of select code for third display D Display of select code for fourth display
- 025.** The popular technique that is used in the integration of ADC chips is **C**
 A successive approximation B dual slope integration
 C successive approximation and dual slope integration D none
- 026.** Which is the ADC among the following? **D**
 A AD 7523 B 74373
 C 74245 D ICL7109
- 027.** The conversion delay in successive approximation of an ADC 0808/0809 is **B**
 A 100 milliseconds B 100 microseconds
 C 50 milliseconds D 50 milliseconds
- 028.** The number of inputs that can be connected at a time to an ADC that is integrated with successive approximation is **C**
 A 4 B 2
 C 8 D 16
- 029.** The input and output operations are respectively similar to the operations, **C**
 A read, read B write, write
 C read, write D write, read

- 030.** The time taken by the ADC from the active edge of SOC(start of conversion) pulse till the active edge of EOC(end of conversion) signal is called **C**
 A edge time B conversion time
 C conversion delay D time delay
- 031.** In 8251, which signal will decide transmission rate? **B**
 A Receiver Clock input B Transmitter Clock input
 C Clock D Reset
- 032.** In 8 channel-ADC interface how many address lines needed to operate the start of conversion channels? **C**
 A 1 B 2
 C 3 D 4
- 033.** The device that is used to obtain an accurate position control of rotating shafts in terms of steps is **C**
 A DC motor B AC motor
 C Stepper motor D Servo motor
- 034.** The priority between the DMA channels requesting the services can be resolved by **C**
 A timing and control block B program command control block
 C priority block D none of the mentioned
- 035.** When interface 8237 does not have any valid pending DMA request then it is said to be in **C**
 A Active state B Passive state
 C Idle state D Dual state
- 036.** To complete a DMA transfer, a memory to memory transfer requires **C**
 A a read from memory cycle B a write to memory cycle
 C a read from and write to memory cycle D a read to memory cycle
- 037.** The number of pulses required for one complete rotation of the shaft of the stepper motor is equal to the **A**
 A number of internal teeth on a rotor B number of internal teeth on a stator
 C number of internal teeth on a rotor and stator D number of external teeth on a stator
- 038.** A simple scheme for rotating the shaft of a stepper motor is called **C**
 A rotating scheme B shaft scheme
 C wave scheme D none
- 039.** To save the DAC from negative transients the device connected between OUT1 and OUT2 of AD 7523 is **B**
 A p-n junction diode B Zener
 C FET D BJT
- 040.** The DAC 0800 has a settling time of **A**
 A 100 milliseconds B 100 microseconds
 C 50 milliseconds D 50 microseconds
- 041.** Which interrupt mode can be used to handle buffer problems in 8259? **B**
 A Edge and Level Triggered Mode B Buffered Mode
 C Poll Command D Fully Nested Mode
- 042.** Which register stores all the interrupt requests in it in order to serve them one by one on priority basis? **B**
 A Priority Resolver B Interrupt Request Register
 C Interrupt Mask Register D Interrupt Control logic
- 043.** 8259A provides _____ vectored interrupts. **B**
 A Four B Eight
 C Six D Seven
- 044.** When non-specific EOI command is issued to 8259 it will automatically _____. **A**
 A Reset the ISR B Set the ISR
 C Reset the INTR D set the INTR

- 045.** Which operating mode is preferred when all the interrupts have equal priority in 8259? **A**
 A Automatic Rotation B Automatic End of Interrupt mode
 C End of Interrupt mode D Fully Nested Mode
- 046.** Which mode will decide whether an interrupt should be level or edge triggered in 8259? **C**
 A Edge and Level Triggered Mode B Automatic End of Interrupt mode
 C Poll Command D Fully Nested Mode
- 047.** The mode of 8237 in which the device transfers only one byte per request is **B**
 A Block transfer mode B Single transfer mode
 C Demand transfer mode D Cascade mode
- 048.** _____ is the default operating mode in 8259. **D**
 A Special Mask Mode B Automatic End of Interrupt mode
 C End of Interrupt mode D Fully Nested Mode
- 049.** In 8051, when EA is held low, code is fetched from _____. **C**
 A Internal Program Memory Location B External Program Memory Location and Internal Program Memory Location
 C External Program Memory Location D Internal Program Memory Location and External Program Memory Location
- 050.** In 8051, when ALE=1 then what happens? **A**
 A Port 0 has address from A0-A7 and data, Port 2 has address from A8-A15 B Port 1 has address from A0-A7 and data, Port 3 has address from A8-A15
 C Port 0 has address from A0-A7 and data, Port 3 has address from A8-A15 D Port 1 has address from A0-A7 and data, Port 2 has address from A8-A15
- 051.** What is pin no. 40 in 8051? **C**
 A ground B reset
 C V_{CC} D P2.2
- 052.** In 8051, Program Counter stores Address of _____. **B**
 A current instruction B next instruction
 C previous instruction D cannot be determined
- 053.** Which of the following is the features of 8051? **B**
 A 16 bit bi-directional data bus B 16 bit address
 C 32 bit data pointer D 8 bit Stack pointer
- 054.** In 8051, which of the following is an Open drain Bi-directional I/O Port? **A**
 A Port 0 B Port 1
 C Port 2 D Port 4
- 055.** In 8259, the interrupt control logic **B**
 A manages interrupt acknowledge B manages priority of the interrupt signals
 C resets the 8259 D manages the power supply
- 056.** In a cascaded mode, the number of vectored interrupts provided by 8259A is **B**
 A 8 B 64
 C 16 D 32
- 057.** Which of the following Port in 8051 can be used only as I/O? **B**
 A Port 0 B Port 1
 C Port 2 D Port 3
- 058.** How many bytes are allocated for general Purpose registers in 8051? **A**
 A 80 bytes B 32 Bytes
 C 16 Bytes D 90 Bytes
- 059.** In 8051, TR1 and TF1 bits are present in _____ Special Function register. **C**
 A IE B TMOD
 C TCON D SCON
- 060.** In 8051, to select timer 1 and mode 1 what value has to be loaded into TMOD register. **B**
 A 0010 0000B B 0001 0000B

- C Statement I is true and Statement II is false
D Statement I is false and Statement II is true
- 076.** INC A If this instruction is executed using 8051 compiler, then what is the value of A after the execution of this instruction if A=FFH? **B**
A 100H
B 00H
C 01H
D FFH
- 077.** In 8051, when CJNE statement is executed _____ flag is updated. **A**
A CY
B AC
C No flag is updated
D Overflow flag
- 078.** In a microcontroller to act as input port we load with _____ value. **A**
A FFH
B 00H
C 11H
D 22H
- 079.** In a microcontroller to act as output port we load with _____ value. **B**
A FFH
B 00H
C AAH
D BBH
- 080.** While programming the ADC0808/0809 IC what steps are followed? **B**
A select the analog channel, start the conversion, monitor the conversion, display the digital results
B select the analog channel, activate the ALE signal (L to H pulse), start the conversion, monitor the conversion, read the digital results
C select the analog channel, activate the ALE signal (H to L pulse), start the conversion, monitor the conversion, read the digital results
D select the channel, start the conversion, end the conversion
- 081.** In ADC0808/0809 IC which pin is used to select Step Size? **A**
A Vref
B Vin
C Vref/2 & Vin
D Vref/2
- 082.** In 8051, when serial communication is performed then which of the following flag has to be monitored whether the data is transmitted or not? **A**
A TI
B RI
C INTO
D TF
- 083.** External Interrupts are given from which port in 8051? **A**
A P3.2 and P3.3 of 8051
B P3.4 or P3.5 of 8051
C P 3.0 or P3.1 of 8051
D P3.6 or P3.7 of 8051
- 084.** What do you mean by not bit addressable Register in 8051? **A**
A Bit change is not possible
B Bit change is possible
C cannot be determined
D Bit by bit operation can be performed on it
- 085.** In 8051, Which of the following SFR is not bit Addressable? **C**
A IP
B IE
C PCON
D TCON
- 086.** How many times will the following loop execute using 8051 compiler? MOV R6,#10
HERE: DJNZ R6, HERE
END **A**
A 10
B 14
C 12
D 13
- 087.** What is described by this command: CJNE A,#00001111b, ROW1 **D**
A it masks the bit and then jumps to the label where ROW1 is written
B it makes the value of the accumulator 0FH and then jumps at the address where ROW1 label is written
C it compares the value of the accumulator with 0FH and jumps to the location where ROW1 label is there if the value becomes equal
D it compares the value of the accumulator with 0FH and jumps to the location where ROW1 label is there if the value is not equal
- 088.** To identify that which key is being pressed, we need to: **B**

- A ground all the pins of the port at a time B ground pins of the port one at a time
- C connect all the pins of the port to the main supply at a time D Both B & C
- 089.** Which of the following steps detects the key in a 4*4 keyboard matrix about the key that is being pressed? **D**
- A masking of bits B ensuring that initially, all keys are open
- C checking that whether the key is actually pressed or not D all of the mentioned
- 090.** Which of the following statements are true about DAC0808? **A**
- A parallel digital data to analog data conversion B it has current as an output
- C Both A & B D None of the mentioned
- 091.** What is the function of the SCLK pin in MAX1112? **B**
- A It is used to bring data in B It is used to bring data out and send in the control byte, one at a time
- C It is used to get output clock D It is used to get serial output
- 092.** How can we control the speed of a stepper motor? **A**
- A by controlling its switching rate B by controlling its torque
- C by controlling its wave drive 4 step sequence D cant be controlled
- 093.** Which of the following can be a unit for torque? **B**
- A kg/m^2 B ounce-inch
- C kg-m^3 D g/m
- 094.** With a stator having 8 teeth and a rotor having 6 teeth, what step angle will an application be able to achieve? **A**
- A 15° B 51°
- C 20° D 105°
- 095.** A modern traffic signal system consists of _____ basic subsystems: i) The signal lights in their housing ii) The supporting arms or poles iii) The electric controller **C**
- A i & ii only B i & iii only
- C i, ii & iii only D ii & iii only
- 096.** What is the difference between full-step and half-step? **D**
- A In full-step two phases are on and in half-step only one phase is on. B More resonance is evident in half-step
- C More power required for full-step D Half-step offers better resolution
- 097.** How many data lines are there in a 16*2 alphanumeric LCD? **B**
- A 16 B 8
- C 4 D 32
- 098.** For writing commands on an LCD, RS bit is **B**
- A set B reset
- C set & reset D None of the mentioned
- 099.** Which command of an LCD is used to shift the entire display to the right? **A**
- A 0x1C B 0x18
- C 0x05 D 0x07
- 100.** Which of the following step/s is/are correct for sending data to an LCD? i) set the R/W bit ii) set the E bit iii) set the RS bit **C**
- A i & ii only B i & iii only
- C i, ii & iii only D ii & iii only
- 101.** If the Most Significant Byte (MSB) is stored first while ordering byte values for storing data in memory, it is called as **A**
- A Big-endian B Little-endian

- C Big- and Little-endian D None of them

102. How do Direct Addressing Mode instructions compare with respect to the Indirect Addressing Mode instructions? **A**

A Faster B Slower
C No difference D None of the above

103. Evaluate the following statements and select the appropriate answer given from the choices below. I. Von Neumann Architecture shares common memory for Data and Instructions II. Harvard Architecture has separate physical memories for Data and Instructions **C**

A Only I is true B Only II is true
C Both I and II are true D None of them is true

104. ARM processors were basically designed for _____ **C**

A Main frame systems B Distributed systems
C Mobile systems D Super computers

105. The address space in ARM is _____ **D**

A 2^{24} B 2^{64}
C 2^{16} D 2^{32}

106. Memory can be accessed in ARM systems by _____ instructions. i) Store ii) MOVE iii) Load iv) arithmetic v) logical **B**

A i, ii, iii B i, ii
C i, iv, v D iii, iv, v

107. Which of the following register in ARM7 is used to point to the location of currently executing instruction in a program? **C**

A R1 B R5
C R15 D R8

108. Which of the following statements are true with respect to pipelining. I. Pipelining is an implementation technique whereby multiple instructions are overlapped in execution. It is not visible to the programmer II. Each step is called a pipe stage or pipe segment III. Pipeline machine cycle is the time required to move an instruction one step down the pipeline **A**

A All are true B I and III are true
C II and III are true D None of them are true

109. Control signals can be categorized by the pipeline stage that uses them. Which one of the following signal could be used in the Execution stage of an instruction? **C**

A MemRead B RegWrite
C ALUOp D PCsrc

110. How many bits are required to specify the Register operands in an ARM7 instruction? **C**

A 32 bits B 16 bits
C 4 bits D 2 bits

111. Which of the following statements are true? I. In Little endian mode it is easier to determine a sign of the number II. Little endian mode is easier for addition and multiplication of multi-precision numbers III. Big endian mode is easier to divide two numbers IV. Big endian mode is easier to compare two numbers **D**

A I & II are true B III & IV are true
C I & III are true and II and IV are false D I & II are false and III and IV are true

112. Consider a 4-bit ALU which does 4-bit arithmetic. When the following 4-bit numbers are added, what is the status of NZCV flags? $1101 + 1011$ **D**

A NZCV = 0111 B NZCV = 1000
C NZCV = 1001 D NZCV = 1010

113. Evaluate the following statements I. R13 is traditionally used as the stack pointer and stores the head of the stack in the current processor model II. R14 is the link register where the core puts the return address on executing a subroutine III. R15 is the program counter and contains the address of the next instruction to be fetched **A**

- A All the options are true
C II and III are true
- B I and II are true
D I and III are true
- 114.** How many registers are there in ARM7? **C**
A 35register (28 GPR and 7 SPR)
B 37registers (28 GPR and 9 SPR)
C 37registers (31 GPR and 6 SPR)
D 35register (30 GPR and 5 SPR)
- 115.** Which type of non-privileged processor mode is entered due to raising of high priority of an interrupt? **B**
A User mode
B Fast Interrupt Mode (FIQ)
C Interrupt Mode (IRQ)
D Supervisor Mode (SVC)
- 116.** Using only two instructions, add a 64-bit integer contained in R2 and R3 to another 64-bit integer contained in R0 and R1, and place the result in R4 and R5. **B**
A ADD r4, r0, r2 ; ADC r5, r1, r3 ;
B ADDS r4, r0, r2 ; ADCS r5, r1, r3 ;
C ADD r4, r0, r2 ; ADD r5, r1, r3 ;
D ADD r4, r0, r2 ; ADCS r5, r1, r3 ;
- 117.** An instruction that is used to move data from an ARM Register to a Status Register (CPSR or SPSR) is called _____. **C**
A MRC
B MRS
C MSR
D MCS
- 118.** Which among the following data processing instructions does not use the barrel shifter? **A**
A ADD R2, R5, R4
B MOV R5, R4, LSL #2
C MOV r5, R4, LSR #2
D MOV r5, R4, ROR #2
- 119.** If the initial register contents of R0, R1 and R2 were R0= 0x00000000 R1= 0x02040608 R2= 0x10305070 Assume R0 is the result register, after one of the operations below was performed on R1 and R2, which has been modified to R0 = 0x12345678 What was the operation performed on the contents of R2 and R1? **B**
A AND
B ORR
C BIC
D MUL
- 120.** What are the contents of R1 and R2 after MVN R1 R2 are executed, assume R2 is 0x01010101 **B**
A i) R2 = 0x01010101 ii) R1 = 0x01010101
B i) R2 = 0x01010101 ii) R1 = 0x10101010
C i) R2 = 0x10101010 ii) R1 = 0x01011101
D i) R2 = 0x01100110 ii) R1 = 0x01010101
- 121.** In the branch instructions of ARM, what does the mnemonic BVC imply? **D**
A Overflow Set
B Carry Set
C Carry Clear
D Overflow Clear
- 122.** In Cortex-A processor series, which among the following is the standalone and smallest processor in size constraints with high-end application support? **A**
A Cortex-A5
B Cortex-A9
C Cortex-A53
D Cortex-A59
- 123.** Which mnemonic implies plus meaning in the branch instructions? **A**
A BPL
B BEQ
C BMI
D BAL
- 124.** Abort mode generally enters when _____. **A**
A an attempt access memory fails
B low priority interrupt is raised
C ARM processor is on rest
D undefined instructions are to be handled
- 125.** _____ number of non-privileged modes in ARM **B**
A 6
B 1
C 2
D 7
- 126.** Which of the following is not privileged mode **D**
A Abort
B FIQ
C Undefined
D User
- 127.** _____ number of privileged modes in ARM **A**

- A 6
C 4
- B 5
D 7
- 128.** The built-in NVIC supports up to _____ external interrupt inputs. **A**
A 240
B 120
C 256
D 128
- 129.** How many Stack pointers (SPs) available in the Cortex-M3 processor? **C**
A 4
B 3
C 2
D 1
- 130.** Which bus interface provides access to the Static Random-Access Memory (SRAM), peripherals, external RAM, external devices, and part of the system level memory regions? **B**
A Code memory buses
B System bus
C Private peripheral bus
D AMBA bus
- 131.** What is the capability of ARM Cortex M3 instruction for second? **B**
A 110 MIPS
B 150 MIPS
C 125 MIPS
D 130 MIPS
- 132.** Performance of Cortex-M3 processor with CoreMark 1.0 benchmark is **B**
A 1.25 MHz
B 3.34 MHz
C 12.56 MHz
D 1.98 MHz
- 133.** What is/are the configuration status of control unit in RISC Processors? **A**
A Hardwired
B Microprogrammed
C Microcontroller/Microprocessor
D RISC/CISC
- 134.** _____ is the feature of Nested Vectored Interrupt Controller (NVIC). i. **D**
Nested interrupt support ii. Vectored interrupt support iii. Dynamic priority changes support iv. Reduction of interrupt latency
A i, ii & iii
B ii, iii & iv
C iii, iv & i
D i, ii, iii & iv
- 135.** The pseudo instruction used to load address into the register is **D**
A LOAD
B STORE
C LDR
D ADR
- 136.** In the ARM, PC is implemented using _____ **C**
A Caches
B Heaps
C General purpose register
D Stack
- 137.** What are the Rules for stack use? i) Stack should always be balanced, i.e. functions should have an equal number of pushes and pops ii) Stack accesses (push or pop) should not be performed outside the allocated area iii) Stack reads and writes should not be performed within the free area iv) Stack accesses (push or pop) should be performed outside the allocated area **D**
A i & iii only
B ii & iv only
C i, ii & iv only
D i, ii & iii only
- 138.** Which stack pointer is used by the operating system (OS) kernel, exception handlers, and all application codes that require privileged access? **A**
A Main stack pointer
B Process stack pointer
C PUSH stack pointer
D POP stack pointer
- 139.** In the Cortex-M3 processor, the Program Status Registers (PSRs) are subdivided into **D**
i) Application Program Status register (APSR) ii) Interrupt Program Status register (IPSR) iii) Execution Program Status register (EPSR)
A i & iii
B ii & iii
C i & ii
D i, ii & iii
- 140.** The Nested Vectored Interrupt Controller (NVIC) is located in a memory region called **A** the
A System Control Space (SCS)
B Advanced High-Performance Bus (AHB)
C Advance Peripheral Bus (APB)
D Private Peripheral Bus (PPB)

- 141.** In Cortex-M3 processor, which mode is Used to execute application software? **C**
 A Handler mode B Unprivileged mode
 C Thread mode D User Mode
- 142.** The System bus interface contains logic that controls bit-band accesses as follows: i) It remaps bit-band alias addresses to the bit-band region. ii) For reads, it extracts the requested bit from the read byte, and returns this in the Least Significant Bit (LSB) of the read data returned to the core. iii) For writes, it converts the write to an atomic read-modify-write operation. iv) The processor does not stall during bit-band operations unless it attempts to access the System bus while the bit-band operation is being carried out. **D**
 A i, ii & iii B ii, iii & iv
 C iii, iv & i D i, ii, iii & iv
- 143.** _____ enables reconstruction of program execution. **C**
 A Trace Port Analyzer (TPA) B Memory Protection Unit (MPU)
 C Embedded Trace Macrocell (ETM) D Data Watchpoint and Trace (DWT)
- 144.** _____ is only used if the bus waits the data phase of the buffered store, otherwise the transaction completes on the bus. **A**
 A Write buffer B Bit field
 C System address D Load/Store timing
- 145.** Application Program Status register (APSR) access from? **A**
 A Any processor mode B Privileged mode only
 C Non Privileged mode only D User Mode
- 146.** The benefits of using thumb instruction are as follows **C**
 A Low power consumption B High power consumption
 C Reduction in code memory D Increase in code memory
- 147.** ARM processors were basically designed for _____ **D**
 A Main frame systems B Distributed systems
 C Super computers D Mobile systems
- 148.** The offset used in the conditional branching is _____ bits. **C**
 A 8 B 16
 C 24 D 32