Zagazig University	**CSE 321b Computer Organization**	**Midterm Solution**
Faculty of Engineering	**CSE 401 Computer Engineering (II)**	**April 23rd, 2015**
Computer & Systems Eng.	**(Double-Sided)**	**10:30am – 11:45am**
Winter 2015	**(Duration: 75 minutes)**	**4 pages, 28 questions, 28 points**
رقم الجلوس:	**الفرقة:**	**الاسم:**

Circle the letter of the choice that best answers each of the following questions. No more than one letter should be circled.

1. Which terminal of the memory cell gets connected to the bit line?
   (a) Sense
   (b) Data-in
   (c) Select
   (d) Only (a) and (b)
   (e) Only (b) and (c)

2. Which of the following memory types needs to be completely erased before writing to it?
   (a) DRAM
   (b) EEPROM
   (c) PROM
   (d) Flash memory
   (e) None of the above

3. Which of the following is **not** a characteristic of the SRAM memory?
   (a) It contains no refreshment hardware
   (b) Each cell is built using one transistor
   (c) It is commonly used as a cache memory
   (d) All the above
   (e) None of the above

4. Which of the following acronyms best describes an error-correcting code consisting of the following four code words: 00110, 01101, 10001, 11010?
   (a) DED
   (b) SEC
   (c) Either (a) or (b), but not both
   (d) Both (a) and (b)
   (e) None of the above

5. Which of the following memory types is built using SRAM and DRAM?
   (a) SDRAM
   (b) CDRAM
   (c) RDRAM
   (d) All the above
   (e) None of the above

6. Which of the following statements about "magneto-resistive sensors" is **false**?
   (a) They are used in the write heads of magnetic disks
   (b) Their electrical resistance does not get affected by the direction of the magnetic field
   (c) They are no longer used in modern magnetic disks
   (d) All the above
   (e) None of the above

7. Which of the following statements about "multiple zone recording" is **true**?

(a) It gives the same capacity to all the tracks on the disk
(b) It makes it easier to locate any sector on the disk
(c) It is no longer used in modern magnetic disks
(d) All the above
(e) None of the above

8. Two hard disk drives have identical values of all their parameters (*i.e.*, average seek time, total disk capacity, … *etc.*) except that: (i) the first rotates twice as fast as the second, and (ii) the second stores on each track twice as much data as the first. Which of the two disk drives has a higher maximum transfer rate?

(a) First
(b) Second
(c) Same
(d) Inconclusive (because the given information is insufficient)
(e) None of the above

9. Among all the RAID levels, _____ has the best data availability, while _____ achieves the largest data transfer rate.

(a) RAID 4 RAID 3
(b) RAID 6 RAID 2
(c) RAID 0 RAID 3
(d) RAID 3 RAID 4
(e) None of the above

10. Three magnetic disks are configured as RAID 3 (with byte-strips taking numbers starting at #0). What will be the value of strip #120 if the values of strips #119, #121 and #122 are 128, 112 and 80, respectively?

(a) 192
(b) 240
(c) 32
(d) 160
(e) None of the above

11. Which of the following RAID levels has no commercial implementations?

(a) RAID 2
(b) RAID 4
(c) RAID 5
(d) Only (a) and (b)
(e) Only (b) and (c)

12. What is the main disadvantage of RAID 1 (compared to the other RAID levels)?

(a) Highest disk overhead
(b) Worst I/O request rate
(c) Worst data availability
(d) Most complex controller design
(e) None of the above

13. Which of the following statements about "floating-gate MOSFET" is **false**?

(a) It is used to implement the flash memory cell
(b) Its threshold voltage gets smaller when electrons are trapped in its floating gate
(c) Electrons trapped in its floating gate can be released by quantum tunneling
(d) All the above
(e) None of the above

14. Which of the following is an advantage of the NAND flash memory over the NOR flash memory?
(a) Faster read
(b) Simpler interface
(c) Lower error rate
(d) Higher density
(e) None of the above

15. Which of the following optical disks is considered a "write-once-read-many" (WORM) memory?
(a) CD-R
(b) DVD-R
(c) BD-R
(d) All of the above
(e) None of the above

16. Which of the following statements about "magnetic tape" is **false**?
(a) It represents one of the oldest secondary storage technologies
(b) Its access method is direct
(c) It is mainly used for offline storage
(d) It stores the data on linear tracks
(e) None of the above

17. Which registers in the I/O module get connected to the data bus?
(a) Data registers
(b) Status registers
(c) Control registers
(d) All the above
(e) Only (a) and (b)

18. Which of the following tasks is **not** performed by the software during the processing of an interrupt?
(a) Pushing the program status word (PSW) onto the control stack
(b) Saving any additional information about the interrupted program
(c) Transferring the data between the I/O module and the CPU
(d) Restoring the state of the interrupted program
(e) None of the above

19. Which of the following statements best describes the I/O function of the GPU?
(a) It responds to CPU commands
(b) It interrupts CPU
(c) It fetches/executes an I/O program from its local memory
(d) It directly transfers data to/from main memory
(e) It fetches/executes and I/O program from main memory

20. Which of the following techniques makes it possible to connect multiple I/O devices to the CPU using a single interrupt request line?
(a) Software polling
(b) Hardware polling
(c) Bus mastering
(d) All the above
(e) None of the above

21. An $m \times n$ memory chip is to be connected to a bus that supports an address space of x n-bit locations. How many address lines of the bus should be used to derive the chip select (CS) signal of the memory?
(a) x/m
(b) $x/(m.n)$
(c) $\log_2(x/m)$
(d) $\log_2(x/(m.n))$
(e) None of the above

22. An error-correcting code is designed such that every legal codeword must contain n identical copies of each bit of the corresponding dataword. How many bit-errors are guaranteed to be corrected by this code?

(a) $n-1$
(b) $(n/2)+1$
(c) $(n+1)/2$
(d) Either (b) or (c)
(e) None of the above

23. How long (in seconds) is the memory cycle of a DDR2-SDRAM that produces x data words each second?

(a) $1/x$
(b) $2/x$
(c) $4/x$
(d) $8/x$
(e) None of the above

24. A magnetic disk has multiple double-sided platters. How many platters does this disk have if the physical address of the last sector on the disk is known to be (x, y, z)?

(a) $x+1$
(b) $y-1$
(c) $(y+1)/2$
(d) $(z-1)/2$
(e) None of the above

25. A NAND flash memory has a total of x blocks. Each block contains y pages. Each page contains z bytes. What is the smallest number of bytes that can be erased at once?

(a) z
(b) $y.z$
(c) $x.y.z$
(d) $(x.y.z)/2$
(e) None of the above

26. A CD-ROM drive operates at a constant linear velocity of x m/s. When the head reaches some point P on the disk, the disk spins at y r/s to keep its linear velocity fixed. How far is point P from the disk center

(a) $x/(2.\pi.y)$
(b) $y/(2.\pi.x)$
(c) $(2.\pi.x)/y$
(d) $(2.\pi.y)/x$
(e) None of the above

27. A magnetic tape drive applies serpentine recording using a single head with x read/write elements. If each track on the tape can store y blocks of data, which of the following blocks is located at the tape end?

(a) Block $\#(4.x.y)$
(b) Block $\#(3.x.y)$
(c) Block $\#(2.x.y)$
(d) Block $\#0$
(e) None of the above

28. A DMA controller buffers data from an input device and sends it to the memory over the bus in a **transparent mode**. The input device produces x bytes of data every second. Each byte takes one bus cycle to be transferred to the memory. The bus speed is y cycles/s. The CPU uses the bus z% of the time. What is the maximum value of x (that guarantees that the DMA data buffers never overflow)?

(a) $yz/100$
(b) $y-(z/100)$
(c) $(y-z)/100$
(d) $y(1-z/100)$
(e) None of the above

** End of Exam **