Zagazig University	**CSE 321b**	**Midterm Examination**
Faculty of Engineering	**Computer Organization**	**April 26th, 2017**
Computer & Systems Eng.	**(Single-Sided)**	**10:30am – 11:45am**
2nd Term – 2016/2017	**(Duration: 75 minutes)**	**4 pages, 25 questions, 25 points**
الاسم:	**رقم الجلوس:**	

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

1. What is the main advantage of SRAM over DRAM?
   (a) Faster
   (b) Cheaper
   (c) Denser
   (d) Non-volatile
   (e) None of the above

2. Which of the following terms refers to a read-mostly memory?
   (a) ROM
   (b) PROM
   (c) EPROM
   (d) Only (a) and (b)
   (e) Only (b) and (c)

3. Which of the following values can be written to a PROM location that currently stores $(6A)_h$?
   (a) $(FF)_h$
   (b) $(48)_h$
   (c) $(7B)_h$
   (d) All of the above
   (e) None of the above

4. How many mem. chips are needed to build an $m \times n$ mem. module in one-bit-per-chip organization?
   (a) At least *m* chips
   (b) At least *n* chips
   (c) At most *m* chips
   (d) At most *n* chips
   (e) None of the above

5. What is the biggest mem. module that can be build by one *x*-bit-input decoder and *y* $m \times n$ mem. chips?
   (a) $x*m \times y*n/x$
   (b) $y*m/2^x \times 2^x*n$
   (c) $2^x*m \times y*n/2^x$
   (d) $2^x*m \times y*n$
   (e) None of the above

6. A memory implements a 7-bit Hamming SEC-DED code. Each codeword is interpreted as follows: "$PD_6D_5C_4D_3C_2C_1$". Which conclusion can be drawn if the codweword "1110001" is read from the memory?
   (a) There are no errors
   (b) There is only a single error, and it happens to the parity bit (P)
   (c) There is only a single error, and it happens to a data bit (D_i)
   (d) There is only a single error, and it happens to a Hamming-code bit (C_i)
   (e) None of the above

7. Which of the following sets includes the legal codewords of a SEC-DED code?
   (a) {000000,011010,100101,111111}
   (b) {00000000,00101100,01011101,11111111}
   (c) {0000000,1011010,1110100,0111111}
   (d) Only (a) and (b)
   (e) None of the above

8. Which of the following DIMM's has a data rate of $4*n*x$ b/s if the bus speed is x Hz?
   (a) $m \times n$ SDRAM
   (b) $m \times n$ DDR-SDRAM
   (c) $m \times n$ DDR2-SDRAM
   (d) $m \times n$ DDR3-SDRAM
   (e) None of the above

9. Which of the flowing optical disks has a media that can be in one of two states: amorphous or crystalline?
   (a) CD-RW
   (b) CD-ROM
   (c) CD
   (d) CD-R
   (e) None of the above

10. What is the maximum angular velocity in a CD-ROM technology that has the following parameters: data rate = x b/s, data density = y b/m, inner media diameter = z_1 m, outer media diameter = z_2 m?
   (a) $(\pi * y * z_1)/x$ r/s
   (b) $x/(y * z_1)$ r/s
   (c) $(x * y)/(\pi * z_1)$ r/s
   (d) $x/(\pi * y * z_2)$ r/s
   (e) None of the above

11. 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 programmed at once?
   (a) one
   (b) z
   (c) $y.z$
   (d) $x.y.z$
   (e) None of the above

12. Which of the following is **not** among the advantages of SSD's over HDD's?
   (a) Lower cost per bit
   (b) Lower power consumption
   (c) Lower access time
   (d) Higher data transfer rate
   (e) None of the above

13. Which lines of the bus are used to transfer the arguments of I/O commands?
   (a) Data lines
   (b) Address lines
   (c) Control lines
   (d) All of the above
   (e) None of the above

14. In memory-mapped I/O, how many address lines are needed to support x memory locations and y I/O devices?
   (a) $\log_2(x)$
   (b) $\log_2(y)$

(c) $\log_2(x+y)$
(d) $\log_2(\max(x,y))$
(e) None of the above

15. How are interrupts prioritized in software polling?
(a) By the physical proximity
(b) By the bus arbiter
(c) By the polling program
(d) By the interrupt lines
(e) None of the above

Questions 16 – 19 are based on the following information:

RAID 01 and RAID 10 are two non-standard RAID configurations. Suppose the total number of disk drives used in each of these configurations is *x*, and each drive has a capacity of *y*. In RAID 01, the drives are split into two sets of equal size (*x*/2 drives each) where each set is configured to operate internally as a RAID 0 array, and then the sets are connected together (from the outside) to form a RAID 1 array with two logical drives (one per each set). In RAID 10, the drives are split into *x*/2 sets of equal size (two drives each) where each set is configured to operate internally as a RAID 1 array, and then the sets are connected together (from the outside) to form a RAID 0 array with *x*/2 logical drives (one per each set).

16. Which of the following is shared between RAID 01 and RAID 10?
(a) *x* must be even
(b) *x* must be greater than two
(c) Overall data storage capacity is $x*y/2$
(d) All the above
(e) None of the above

17. If one of the disk drives fails in either RAID 01 or RAID 10, what are the chances that an immediate failure of a second drive will result in a data loss?
(a) $2/(x/2-1)*100$ %
(b) $(x/2)/(x-1)*100$ %
(c) $1/(x-1)*100$ %
(a) 50 %
(b) None of the above

18. If one of the disk drives fails in RAID 01, what are the chances that an immediate failure of a second drive will result in a failure of the whole array (regardless whether data is lost or not)?
(a) $2/(x/2-1)*100$ %
(b) $(x/2)/(x-1)*100$ %
(c) $1/(x-1)*100$ %
(d) $1/(x/2)*100$ %
(e) None of the above

19. If one of the disk drives fails in RAID 10, what are the chances that an immediate failure of a second drive will result in a failure of the whole array (regardless whether data is lost or not)?
(a) $2/(x/2-1)*100$ %
(b) $(x/2)/(x-1)*100$ %
(c) $1/(x-1)*100$ %
(d) $1/(x/2)*100$ %
(e) None of the above

Questions 20 – 23 are based on the following information:

Consider a hard-disk drive in which platters spin at a speed m r.p.s and each track is divided into n sectors. Suppose it takes a seek time of p seconds and a rotational delay of q seconds for the head to move from sector $(0,0,1)$ to sector (x, y, z). Assume that $p*m$ is an integer value.

20. Which of the following statements about this HDD is **false**?
    (a) Number of heads is greater than y
    (b) Number of platters is greater than $(y \div_{\text{INT}} 2)$
    (c) Multiple zone recording is used
    (d) All the above
    (e) None of the above

21. Based on the given information, what is the average seek time between any two adjacent tracks?
    (a) p/x
    (b) p/y
    (c) $p/(z-1)$
    (d) $1/2m$
    (e) None of the above

22. Which sector will be underneath the head at the end of the seek time?
    (a) $(x,0,1)$
    (b) (x,y,z)
    (c) $(x,y,z/2)$
    (d) $(x,0,z)$
    (e) None of the above

23. Which of the following formulas can be used to calculate the rotational delay q?
    (a) $q=1/2(m*n)$
    (b) $q=(z+y-1)/(m*n)$
    (c) $q=z/(m*n)$
    (d) $q=(z-1)/(m*n)$
    (e) None of the above

Questions 24 – 25 are based on the following information:

A high-speed input device produces w blocks of data each second. Each block contains x bytes of data and takes y seconds to be produced. With each new block, an integrated DMA controller starts to buffer the data of the block and send it right away to memory over the bus using cycle-stealing at a rate of z B/s until completion. Assume that y is less than x/z.

24. What is the minimum size of the DMA buffer?
    (a) 0
    (b) x
    (c) $x-y*z$
    (d) $x-(1/w-y)*z$
    (e) None of the above

25. What percentage of the bus cycles are used by the DMA controller?
    (a) $((z-w*x)/z)*100$ %
    (b) $(z/(w*x))*100$ %
    (c) $(z/(z-w*x))*100$ %
    (d) $((w*x)/z)*100$ %
    (e) None of the above

** End of Exam **