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GATE 2019 Computer Science & IT

Memory Based
Questions and Solutions
of forenoon session

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COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

- Q.1** The police has arrested four criminals P , Q , R and S .
 P : says Q committed crime
 Q : says S committed crime
 R : says "I didn't do it"
 S : says what Q said about me is false.
There is only one criminal and also only one of the above statements is correct. Who among the four committed the crime?
(a) P (b) Q
(c) R (d) S

● ● ● **End of Question**

- Q.2** Two cars start at same place in same direction at same time. Car 'A' has speed of 50 km/hr, car 'B' has speed of 60 km/hr. After how many hours the distance between them will be 20 kms?
(a) 24 (b) 2
(c) 5 (d) 3

● ● ● **End of Question**

- Q.3** The court is for judge as a _____ to a teacher.
(a) Syllabus (b) Punishment
(c) Student (d) School

● ● ● **End of Question**

- Q.4** 10 students decide to buy gift for their teacher. After buying gift, 2 of the students do not pay their share. Then share of the remaining students increases by 150 each. What is the cost of the gift?
(a) 3000 (b) 6000
(c) 1200 (d) 666

● ● ● **End of Question**

- Q.5** Consider the language: $L = \{a^{2+3k} \text{ or } b^{10+12k}\}$ for $k \geq 0$. Which of the following is correct for the length of string L to satisfy Pumping Lemma?
(a) 5 (b) 24
(c) 9 (d) 3

● ● ● **End of Question**

- Q.6** The search engine business model _____ around fulcrum of trust.
(a) Sink (b) Plays
(c) Revolves (d) #

● ● ● **End of Question**

- Q.7** The expenditure of project _____ as follows: (Expenditure: 20 lakhs, Salary: 12 lakhs, Contingency: 3 lakhs)
- (a) Break (b) Breakdown
(c) Breaks (d) Breaks down

● ● ● **End of Question**

- Q.8** Consider the following processes using preemptive shortest remaining time first.

	P_1	P_2	P_3	P_4
Arrival time	0	1	3	4
CPU time	3	1	3	Z

If the average waiting time is 1 millions then what is the value of Z ?

● ● ● **End of Question**

- Q.9** Consider the following C program

```
#include<stdio.h>
int r()
{
    Static int num = 7;
    return num--;
}
int main()
{
    for ( r(); r(); r() )
        Printf("%d",r() );
    return 0;
}
```

What is the output of the above C program?

- (a) 73 (b) 52
(c) 41 (d) 31

● ● ● **End of Question**

- Q.10** Consider the cache memory size of 16 kB, and cache block size is 16 bytes. The processor generates the physical address of 32 bits. Assume the cache is fully associative. What are the TAG and index bits_____
- (a) 28 and 4 bits (b) 24 and 4 bits
(c) 28 and 0 bits (d) 24 and 0 bits

● ● ● **End of Question**

- Q.11** Which of the following protocol are used to send and retrieve emails respectively?
- (a) SMTP and IMAP (b) SMTP and POP3
(c) IMAP and POP3 (d) POP3 and SMTP

● ● ● **End of Question**

Q.12 What is the value of $\lim_{x \rightarrow 3} \frac{x^4 - 3^4}{2x^2 - 5x - 3}$

(a) $\frac{12}{7}$

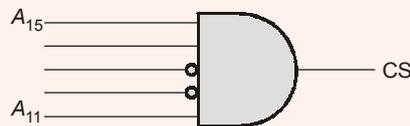
(b) $\frac{104}{12}$

(c) $\frac{108}{7}$

(d) Limit not exists

● ● ● End of Question

Q.13 The chip selects logic for a certain DRAM chip in memory design shown. Assume that memory has 16 address of memory system (in hexadecimal) that can be enabled by chip select?



- (a) CA00 to CAFF
(c) C800 to CFFF

- (b) DA00 to DAFF
(d) C800 to C8FF

● ● ● End of Question

Q.14 Which of the following is not a valid identity

(a) $x \oplus y = (xy + x'y')$

(b) $(x + y) \oplus z = x \oplus (y + z)$

(c) $x \oplus y = x + y$ if $xy = 0$

(d) $(x \oplus y) \oplus z = x \oplus (y \oplus z)$

● ● ● End of Question

Q.15 Let $Z = X - Y$, X , Y , Z are signed magnitude numbers and X , Y are represented in n -bit numbers. To avoid overflow minimum number of bits would require for Z is _____

(a) n -bit

(b) $n + 2$ bits

(c) $n + 1$ bits

(d) $(n - 1)$ bits

● ● ● End of Question

Q.16 A network with three hosts M , N and P have IP address 194.56.10.2, 194.56.10.5 and 194.56.10.6 and their subnet mask is 255.255.255.252. Which of the following will be in a same subnet?

(a) All three will be in same subnet

(b) M and N

(c) N and P

(d) All will be in different subnet

● ● ● End of Question

Q.17 From a complete binary tree T of 8 leaf nodes, two nodes a and b are selected randomly and uniformly. What is the expected length (in edges) between a and b in T ?

_____ ● ● ● **End of Question**

Q.18 What is the 2's complement representation for -28 in 16-bit register
(a) 1111 1111 1110 0100 (b) 0000 0000 0010 0100
(c) 1111 1111 1101 1000 (d) 1111 1111 1111 1100

_____ ● ● ● **End of Question**

Q.19 In RSA algorithm, the value of n is 3007 and the value of $\phi(n)$ is 2880 where ϕ is the Euler's totient function. What is the value of the prime factor which is greater than 50?

_____ ● ● ● **End of Question**

Q.20 If 15 computers are to be connected using 8 port Ethernet switches, then the minimum number of switches required are _____. Assume no separate uplink port is available:

_____ ● ● ● **End of Question**

Q.21 Which of the following is an equivalent relation of a group G ?

$$R_1 : \forall a, b \in G, a R_1 b \text{ if only } \exists g \in G : a = g^{-1}bg$$

$$R_2 : \forall a, b \in G, a R_2 b \text{ if only } a = b^{-1}$$

- (a) Both R_1 and R_2 (b) R_2
(c) R_1 (d) None of these

_____ ● ● ● **End of Question**

Q.22 Which of the following is not correct about B+ Tree, which is used for creating an index of a relational database table?

- (a) Key values in each node are kept in sorted order
(b) Leaf node pointer points to next node
(c) B+ tree is a height balanced tree
(d) Non-leaf nodes have pointers to data records

_____ ● ● ● **End of Question**

Q.23 The given functional dependency: $F = \{QR \rightarrow S, R \rightarrow P, S \rightarrow Q\}$ holds as a relational schema given for $X = PQRS$ and X is not in BCNF. Now X is decomposed into $Y = PR$ and $Z = QRS$. Consider the following statements.

- (I) Y and Z are in BCNF
(II) Decomposition of X into Y and Z is dependency preserving and lossless join.

Which of the following is correct?

- (a) I only (b) Neither I nor II
(c) Both I and II (d) II only

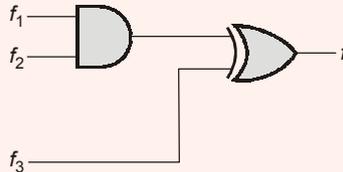
_____ ● ● ● **End of Question**

Q.24 The output 'f' of the following circuit in minterms where

$$f_1 = \sum m (0, 2, 5, 8, 14)$$

$$f_2 = \sum m (2, 3, 6, 8, 14, 15)$$

$$f_3 = \sum m (2, 7, 11, 14)$$



- (a) $\sum m (2, 14)$
- (b) $\sum m (2, 7, 8, 11, 14)$
- (c) $\sum m (0, 2, 3, 5, 6, 7, 8, 11, 14, 15)$
- (d) $\sum m (7, 8, 11)$

● ● ● End of Question

Q.25 Minimum number of 2-input NOR gates required to implement 4-variable function expressed in sum of minterms as $f = \sum m (0, 2, 5, 7, 8, 10, 13, 15)$. Assume that all the inputs and their complements are available_____.

● ● ● End of Question

Q.26 Assume INODE contains 12 direct pointers, 1 Single Indirect pointers and 1 Doubly Indirect pointer. The block size is 4 kB and pointer size is 32 bits. What is the maximum possible file size?_____GB (Round off to 1 decimal places)

● ● ● End of Question

Q.27 Consider the following statements.

- (i) In max Heap smallest element is at the leaf node.
- (ii) In max Heap second largest element always the child of root.
- (iii) Binary search tree can be constructed from max heap in $\theta(n)$.
- (iv) Max Heap can be build from Binary search tree in $\theta(n)$

Which of the above option is correct?

- (a) (i), (ii) and (iii)
- (b) (i), (ii) and (iv)
- (c) (ii), (iii) and (iv)
- (d) (i), (iii) and (iv)

● ● ● End of Question

