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No. Uni./Estb./ .13.00...

Dated: 30/05/23

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The Question Paper and Answer Key w.r.t. test conducted on dated 30.05.2023 for the post of Assistant Professor (Computational Sciences/ Computer Applications) is available on the official website of the University.

The candidates appeared in this test are hereby informed that in case of doubt/Objection regarding any question or answer, the same may be forwarded (along with supporting documents) within 04 days (i.e. upto 03.06.2023, 5:00 PM) via e-mail dy.reg@mrsptu.ac.in

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RECRUITMENT TEST OF POST

Assistant Professor in Computational Science / Computer Applications-2023

Roll No. _____ Date: _____ Signature of the Candidate: _____

- 1) What is the output of the following code?

```
class test {  
    public $value = 0;  
    function test () {  
        $this->value = 1; }  
    function __construct() {  
        $this->value = 2;}  
    }  
    $object = new test ( );  
    echo $object->value;
```

- (a) 2
(b) 1
(c) No Output, PHP will generate an error message.
(d) 3

- 2) Given JavaScript code snippet.

```
function foo() {  
    let a = b = 0;  
    a++; return a;  
} foo();
```

The output of the following code in JavaScript console.

```
typeof a; // => ???  
typeof b; // => ???
```

- (a) NaN , undefined
(b) 0, undefined
(c) Number, undefined
(d) undefined, Number

- 3) What is the output of the following code?

```
#include "stdlib.h"  
int main()  
{  
    int *pInt;  
    int **ppInt1;  
    int **ppInt2;  
    pInt = (int*)malloc(sizeof(int));  
    ppInt1 = (int**)malloc(10*sizeof(int*));  
    ppInt2 = (int**)malloc(10*sizeof(int*));  
    free(pInt);
```

```

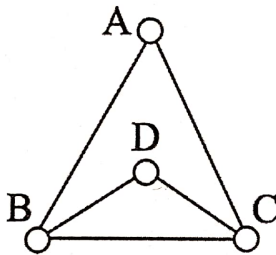
free(ppInt1);
free(*ppInt2);
return 0;
}

```

- (a) malloc() for ppInt1 and ppInt2 isn't correct. It'll give compile time error.
 (b) free(*ppInt2) is not correct. It'll give compile time error.
 (c) free(*ppInt2) is not correct. It'll give run time error.
 (d) No issue with any of the malloc() and free() i.e. no compile/run time error
- 4) If you consider the number of states in minimal DFA and NFA using the regular expression $r = (11 + 111)^*$ over $\{0, 1\}$, you get:
 (a) DFA – 4; NFA – 3; DFA – 4; NFA – 3; DFA – 4;
 (b) DFA – 3; NFA – 3; DFA – 3; NFA – 3; DFA – 3;
 (c) DFA (3), NFA (4)
 (d) DFA – 4; NFA – 4; DFA – 4; NFA – 4; DFA – 4;
- 5) The minimum number of colours required to colour the vertices of a cycle with n nodes in such a way that no two adjacent nodes have the same colour is
 (a) $n - \lfloor (n-1)/2 \rfloor$
 (b) $n - 2 \lfloor n/2 \rfloor + 2$
 (c) $n - 2 \lfloor (n-1)/2 \rfloor + 2$
 (d) $n - \lfloor n/2 \rfloor$
- 6) The language accepted by a Pushdown Automation in which the stack is limited to 10 items is best described as
 (a) Context Free
 (b) Regular
 (c) Deterministic Context Free
 (d) Recursive
- 7) mysql_connect() does not take following parameter
 (a) Database host
 (b) User ID
 (c) Password
 (d) Database name
- 8) A bag contains 5 balls out of which some or maybe all are black. 2 balls are drawn from the bag and both are found to be black. What is the probability that all balls in the bag are black?
 (a) 0.7
 (b) 0.5
 (c) 0.6
 (d) 0.65
- 9) How many number of machine cycle(s) are used in XTHL instruction in 8085 microprocessor?
 (a) $2^x + 2^y$ (Here, $x=0010$ and $y=0000$)
 (b) $2^x + 2^y$ (Here, $x=0100$ and $y=0011$)
 (c) $2^x + 2^y$ (Here, $x=0101$ and $y=0000$)
 (d) $2^x + 2^y$ (Here, $x=0101$ and $y=0011$)
- 10) Choose correct option: -
 Assertion (A1): To perform division in 8085 a repeated subtraction method is followed.
 Assertion (A2): DIV instruction is used to perform division in 8085.
 Reason (R1): As DIV instruction is not available in 8085, it is available in 8086.
 Reason (R2): DIV instruction can be used in 8085 as 8086 microprocessors has large instruction set than 8085 microprocessors.
 (a) Assertion A1 is false and Reason R2 is true
 (b) Assertion A2 is true and Reason R2 is false

- (c) Assertion A2 is false and Reason R1 is false
 (d) Assertion A1 is true and Reason R1 is true
- 11) What does the following function output for a given linked list where first node is head node?
- ```
void funct(struct node* head)
{
 if(head == NULL)
 return;
 funct(head->next);
 printf("%d ", head->data);
}
```
- (a) Prints all nodes of linked lists  
 (b) Prints only one node in the linked list  
 (c) Prints only head node  
 (d) Prints all nodes of linked list in reverse order
- 12) What the following function will output when it will start traversing from the first node of given linked list 1->2->3->4->5->6?
- ```
void funct(struct node* start)
{
  if(start == NULL)
  return;
  printf("%d ", start->data);
  if(start->next != NULL )
  funct(start->next->next);
  printf("%d ", start->data);
}
```
- (a) 1 3 5 5 3 1
 (b) 1 3 4 1 3 5
 (c) 1 2 3 5
 (d) 1 3 4 2 3 1
- 13) Data Hazard is
- (a) Exploitation of data
 (b) On source side data is not ready
 (c) On destination side data is not ready
 (d) On data blocking
- 14) A 4GB of memory capacity is allowed in _____ address bus
- (a) 16 bit
 (b) 32 bit
 (c) 64 bit
 (d) 128 bit
- 15) Processing power is adversely influenced by
- (a) Serial transmission
 (b) Data fluctuation
 (c) Parallel transmission
 (d) Data bus capacity
- 16) Which architecture among the following is based on hardwired control unit?
- (a) X86
 (b) 80836
 (c) RISC
 (d) 8085

- 17) What part in CPU gives instruction to bus unit to read instruction stored in a specific memory location?
- Program counter
 - Prefetch unit
 - Writeback
 - ALU
- 18) What among the following will happen if the pipeline increases from 7 to 9?
- Throughput and latency will increase
 - Latency will increase
 - Throughput will decrease
 - Nothing will happen
- 19) The process of invoking OS from the user program is a ____.
- Overflow
 - Underflow
 - Exception
 - Interrupt
- 20) For which of the following does there exist a tree satisfying the specified constraints?
- A binary tree with 65 leaves and height 6.
 - A binary tree with 33 leaves and height 5.
 - A full binary tree with height 5 and 64 total vertices.
 - A rooted tree of height 3, every vertex has at most 3 children. There are 40 total vertices.
- 21) Use the figure below to answer the following question(s).



- In Figure which of the following is not a circuit in the graph?
- C, A, B, D, C, B
 - A, B, D, C, B
 - B, A, C, D, B, C
 - All of the above are circuits in the graph
- 22) Which of the following statement is correct, if P, Q, and R are sets?
- $P - (Q - R) = (P - Q) - R$.
 - $(P - Q) \cap (R - Q) = (P \cap R) - Q$.
 - $(R - Q) \cap (P - Q) = P - (Q \cup R)$.
 - if $Q \cup R = P \cup R$ then $P = Q$
- 23) Which of the following statements is not correct?
- $\{45, 46, 47\} \subseteq P$ implies that $45 \in P$ and $\{46, 47\} \subseteq P$.
 - $\{45, 46, 47\} \in P$ and $\{45, 46\} \in Q$ implies that $\{47\} \subseteq P - Q$.
 - $P \cap Q \supseteq \{45, 46, 47\}$ implies that $\{45, 46, 47\} \subseteq P$ and $\{45, 46, 47\} \subseteq Q$.
 - $P - Q \supseteq \{46, 47\}$ and $\{44, 45\} \subseteq Q$ implies that $\{44, 45, 46, 47\} \subseteq P \cup Q$.
- 24) Suppose $p(n) = \frac{n}{2} + \frac{1 - (-1)^n}{4}$ where $\forall n \in \mathbb{Z}$. Thus, $p: \mathbb{Z} \rightarrow \mathbb{Z}$, \mathbb{Z} the set of all integers. Which is TRUE?
- p is a function and is not either one-to-one or not onto.

- (b) p is a function and is one-to-one and onto both.
- (c) p is a function and is not one-to-one but onto.
- (d) p is not a function from $Z \rightarrow Z$ because $\frac{n}{2} \notin Z$.
- 25) Suppose \leq be the partial order defined by $A \leq B$ where $A = \{1, 2, 4, 8, 16, 32\}$ and $B: a$ is a factor of b . Which statement is incorrect?
- (a) The given partial order has total order.
- (b) The given relation B is reflexive, anti-symmetric and transitive.
- (c) The given relation B is a pseudo-order.
- (d) The minimal and maximal element in this partial ordering is unique.
- 26) Longest common subsequence can be solved using
- (a) Greedy
- (b) Divide and conquer
- (c) Dynamic Programming
- (d) None of the above
- 27) Which of the following problems are decidable?
- (a) Does a given program ever produce an output?
- (b) If L is a context-free language, then is L' (complement of L) also context-free?
- (c) If L is not a regular language, then is L' also regular?
- (d) If L is a recursive language, then, is L' also recursive?
- 28) Which of the following protocols operates at the Network Layer of the TCP/IP model and provides routing functionality?
- (a) HTTP
- (b) FTP
- (c) IP
- (d) ARP
- 29) Which of the following cache mapping techniques provides the fastest access time?
- (a) Direct mapping
- (b) Fully associative mapping
- (c) Set-associative mapping
- (d) Random mapping
- 30) When comparing the time taken for switching between two processes (t_2) and switching between the user and kernel modes of operation (t_1), which of the following statements is TRUE?
- (a) $t_1 > t_2$
- (b) $t_2 > t_1$
- (c) $t_1 \neq t_2$
- (d) $t_1 = t_2$
- 31) Total number of child processes for
- ```

for(int i=0;i<4;i++){
 fork();
}

```
- (a) 8
- (b) 10
- (c) 15
- (d) 23
- 32) When a research problem is related to heterogeneous population, the most suitable sampling method is:
- (a) Cluster Sampling
- (b) Stratified Sampling
- (c) Convenient Sampling

- (d) Lottery Method
- 33) A null hypothesis is
- When there is no difference between the variables
  - The same as research hypothesis
  - Subjective in nature
  - When there is difference between the variables
- 34) Which of the following is the first step in starting the research process?
- Searching sources of information to locate the problem.
  - Survey of related literature
  - Identification of the problem
  - Searching for solutions to the problem
- 35) Response error, prestige error, non-response error, publication errors are
- Sampling error
  - Non-sampling error
  - Constant error
  - Estimated error
- 36) Snowball sampling is used for data collection through
- Connecting Relations
  - Small population
  - Representatives
  - Absolute error calculation
- 37) In which all the elementary units connected with the problem are studied (surveyed)?
- Questionnaire
  - Census
  - Interview
  - Sampling
- 38) A research problem is not feasible only when:
- it is researchable
  - it is new and adds something to knowledge
  - it consists of independent and dependent variables
  - it has utility and relevance

39) Consider the following C program

```
#include <stdio.h>
#include <unistd.h>

int main() {
 int a = 10;

 if (fork() == 0) {
 // Child process
 a = a + 5;
 printf("%d, %p\n", a, (void*)&a);
 } else {
 // Parent process
 a = a - 5;
 printf("%d, %p\n", a, (void*)&a);
 }

 return 0;
}
```

Let  $u, v$  represent the parent process's printed values and  $x, y$  represent the child process' printed values. Which of the following statements is TRUE?

- (a)  $U = x + 20$  and  $v \neq y$
  - (b)  $U = x + 10$  and  $v \neq y$
  - (c)  $U + 10 = x$  and  $v = y$
  - (d) None of these
- 40) Four concurrent processes W, X, Y, and Z work on a common variable  $x$  that has been initialized to zero as shown below. Both the W and X processes read  $x$  from memory, increment it by 1, store it in memory, and then end. Both the Y and Z processes read  $x$  from memory, reduced it by two, stored it in memory, and then stopped. Before reading  $x$ , each process initiates the P operation (i.e., wait) on a counting semaphore S, and after putting  $x$  in memory, each process initiates the V action (i.e., signal) on the semaphore S. Semaphore S has a two initialization. What is  $x$ 's maximum value when all processes have finished running?
- (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
- 41) A database of research articles in a journal uses the following schema.  
(VOLUME, NUMBER, STARTPAGE, ENDPAGE, TITLE, YEAR, PRICE)  
The primary key is  
(VOLUME, NUMBER, STARTPAGE, ENDPAGE) and the following functional dependencies exist in the schema.  
(VOLUME, NUMBER, STARTPAGE, ENDPAGE)  $\rightarrow$  TITLE  
(VOLUME, NUMBER)  $\rightarrow$  YEAR  
(VOLUME, NUMBER, STARTPAGE, ENDPAGE)  $\rightarrow$  PRICE  
The database is redesigned to use the following schemas.  
(VOLUME, NUMBER, STARTPAGE, ENDPAGE, TITLE, PRICE)  
(VOLUME, NUMBER, YEAR)  
Which is the weakest normal form that the new database satisfies, but the old one does not?
- (a) 1NF
  - (b) 2NF
  - (c) 3NF
  - (d) BCNF
- 42) What is the primary difference between a monolithic and a microkernel operating system?
- (a) Monolithic systems have a single, large kernel, while microkernel systems have a small kernel with additional user-space components
  - (b) Microkernel systems are more secure and stable than monolithic systems
  - (c) Monolithic systems are more efficient than microkernel systems
  - (d) Microkernel systems are more flexible and scalable than monolithic systems
- 43) Among the given options, which is not the required property of Knowledge Representation?
- (a) Inferential Efficiency
  - (b) Inferential Adequacy
  - (c) Representational Verification
  - (d) Representational Adequacy
- 44) Which optimization technique is used to reduce the multiple jumps?
- (a) Latter optimization technique
  - (b) Peephole optimization technique
  - (c) Local optimization technique
  - (d) Code optimization technique



- 45) Consider a two-level cache hierarchy with L1 and L2 caches. An application incurs 1.4 memory accesses per instruction on average. For this application, the miss rate of L1 cache is 0.1; the L2 cache experiences, on average, 7 misses per 1000 instructions. The miss rate of L2 expressed correct to two decimal places is \_\_\_\_\_.
- (a) 0.05  
 (b) 0.06  
 (c) 0.07  
 (d) 0.08
- 46) Select the correct defect rate for Six sigma?
- (a) 3.4 million per million lines of code.  
 (b) 3.0 million per million lines of code.  
 (c) 1.5 million per million lines of code.  
 (d) 1 million per million lines of code.
- 47) Compulsory parameter in setcookie function
- (a) Expire  
 (b) Domain  
 (c) Path  
 (d) Name
- 48) In a relational data model, which one of the following statements is TRUE?
- (a) A relation with only two attributes is always BCNF  
 (b) If all attributes of a relation are prime attributes, then the relation is in BCNF.  
 (c) Every relation has at least one non-prime attribute  
 (d) BCNF decompositions preserve functional dependencies
- 49) In the IPv4 addressing format, the number of networks allowed under Class C addresses is
- (a) 214  
 (b) 27  
 (c) 221  
 (d) 224
- 50) Consider a relation table with a single record for each registered student with a single record for each registered student with the following attributes.
1. Registration Num: Unique registration number of each registered student.
  2. UID: Unique identity number, unique at the national level for each citizen.
  3. BankAccount Num: Unique account number at the bank. A student can have multiple accounts or joint accounts. This attribute stores the primary account number.
  4. Name: Name of the student
  5. Hostel Room: Room number of the hostel.
- Which of the following options is INCORRECT?
- (a) BankAccount Num is candidate key  
 (b) Registration Num can be primary key  
 (c) UID is a candidate key if all students are from the same country  
 (d) If S is a superkey such that  $S \cap \text{UID}$  is NULL then  $S \cup \text{UID}$  is also superkey
- 51) Which one of the following statements about normal forms is FALSE?
- (a) BCNF is stricter than 3NF  
 (b) Lossless, dependency — preserving decomposition into 3NF is always possible  
 (c) Lossless, dependency - preserving decomposition into BCNF is always possible  
 (d) Any relation with two attributes is in BCNF
- 52) Consider the following relation
- Cinema(theater, address, capacity)
- Which of the following options will be needed at the end of the SQL query?
- ```
SELECT P1.address
FROM Cinema P1
```

such that it always finds the addresses of theaters with maximum capacity?

- (a) WHERE P1.capacity >= All (select P2.capacity from Cinema P2)
- (b) WHERE P1.capacity >= Any (select P2.capacity from Cinema P2)
- (c) WHERE P1.capacity > All (select max(P2.capacity) from Cinema P2)
- (d) WHERE P1.capacity > Any (select max(P2.capacity) from Cinema P2)

53) Given the following statements:

S1 : A foreign key declaration can always be replaced by an equivalent check assertion in SQL.

S2: Given the table R(a,b,c) where a and b together form the primary key, the following is a valid table definition.

```
CREATE TABLE S (  
  a INTEGER,  
  d INTEGER,  
  e INTEGER,  
  PRIMARY KEY (d),  
  FOREIGN KEY (a) references R)
```

Which one of the following statements is CORRECT?

- (a) S1 is TRUE and S2 is FALSE.
- (b) Both S1 and S2 are TRUE.
- (c) S1 is FALSE and S2 is TRUE.
- (d) Both S1 and S2 are FALSE.

54) Consider the following transaction involving two bank accounts x and y.

read (x) ; x 50; write (x); read (y); y: write (y)

The constraint that the sum of the accounts x and y should remain constant is that of

- (a) Atomicity
- (b) Consistency
- (c) Isolation
- (d) Durability

55) An Aloha network uses an 18.2 kbps channel for sending message packets of 100 bits long size. Calculate the maximum throughput.

- (a) 5999
- (b) 6900
- (c) 6027
- (d) 5027

56) Which level of locking provides the highest degree of concurrency in a relational database?

- (a) Page.
- (b) Table.
- (c) Row.
- (d) Page, table and row level locking allow the same degree of concurrency.

57) An organization has a class B network and wishes to form subnets for 64 departments. The subnet mask would be

- (a) 255.255.0.0
- (b) 255.255.64.0
- (c) 255.255.128.0

(d) 255.255.252.0

- 58) Consider a B+- tree in which the maximum number of keys in a node is 5. What is the minimum number of keys in any non-root node?
- (a) 1
 - (b) 2
 - (c) 3
 - (d) 4
- 59) Suppose two hosts are connected by a point-to-point link and they are configured to use Stop-end-Wait protocol for reliable data transfer. Identify in which one of the following scenarios, the utilization of the link is the lowest.
- (a) Longer link length and lower transmission rate
 - (b) Longer link length and higher transmission rate
 - (c) Shorter link length and lower transmission rate
 - (d) Shorter link length and higher transmission rate
- 60) Which of the following protocol pairs can be used to send and retrieve e-mails (in that order)?
- (a) IMAR SMTP
 - (b) SMTP, POP3
 - (c) IMAR POP3
 - (d) SMTP, MIME



**Question paper for the post of Assistant Professor in
Computational Sciences (with qualification of MCA & Ph.D).**

Answer Key

1	2	3	4	5	6	7	8	9	10
a	d	d	a	b	b	d	b	a	d
11	12	13	14	15	16	17	18	19	20
d	a	c	b	d	c	b	a	c	d
21	22	23	24	25	26	27	28	29	30
b	b	b	c	c	c	d	c	b	b
31	32	33	34	35	36	37	38	39	40
c	b	a	a	b	a	b	c	c	b
41	42	43	44	45	46	47	48	49	50
b	a	c	b	a	a	d	a	c	a
51	52	53	54	55	56	57	58	59	60
c	a	d	b	c	c	d	b	b	b

Kanishk