

UPSEE 2019

PAPER-CSIT: CODE AA*

ANSWER KEY, Examination Date: 21-04-2019

1	C	26	C	51	B	76	C
2	A	27	B	52	B	77	B
3	A	28	D	53	D	78	B
4	C	29	A	54	A	79	C
5	D	30	C	55	B	80	D
6	C	31	B	56	A	81	C
7	B	32	A	57	D	82	B
8	A	33	D	58	C	83	B
9	D	34	C	59	D	84	D
10	B	35	A	60	C	85	A
11	D	36	B	61	C	86	C
12	B	37	A	62	C	87	C
13	B	38	C	63	C	88	C
14	A	39	D	64	D	89	D
15	B	40	B	65	B	90	D
16	B	41	A	66	B	91	B
17	B	42	C	67	B	92	A
18	A	43	D	68	A	93	A
19	A	44	C	69	C	94	C
20	B	45	D	70	C	95	B
21	D	46	D	71	A	96	C
22	C	47	B	72	A	97	C
23	B	48	D	73	C	98	C
24	A	49	A	74	D	99	B
25	D	50	C	75	A	100	A

Note: In case of any grievance, it must be reported at upseegrievance@aktu.ac.in along with Students Roll No. with Paper Code, Question Booklet Code, Question No. and suggested answer with supporting documents on or before 03rd May 2019.

*प्रश्न पुस्तिका क्रमांक **AA** का प्रश्नपत्र एवं कुंजी प्रकाशित की जा रही है। प्रश्न पुस्तिका क्रमांक **BB, CC** तथा **DD** में प्रश्नों एवं उनके विकल्पों का क्रम परिवर्तित है कृपया तदनुसार उत्तर मिलान करें।



Roll No.

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OMR Answer Sheet No.

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Declaration :

I have read and understood the instructions given on page No. 1

Seal of Superintendent of Examination Centre

Signature of Candidate as signed in application)

Signature of the Invigilator

Name of Candidate :

To be copied by the candidate in your own handwriting in the space given below for this purpose is compulsory.
"You will know you are in the right profession when : you wake anxious to go to work, you want to do your best daily, and you know your work is important."

--

* After cutting half upper part of this page, invigilator preserve it along with student's OMR sheet.



No. of Pages in Booklet including title	16	Time 2 Hours	Marks 400	No. of Questions in Booklet	100
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Roll No.

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Signature of the Invigilator

Name of Candidate :



INSTRUCTIONS TO CANDIDATE

1. Use BLUE or BLACK BALL POINT PEN only for all entries and for filling the bubbles in the OMR Answer Sheet.
2. Before opening the SECURITY SEAL of the question booklet, write your Name, Roll Number (In figures), and OMR Answer-sheet Number in the space provided at the top of the Question Booklet. Non-compliance of these instructions would mean that the Answer Sheet can not be evaluated leading the disqualification of the candidate.
3. Each question carries FOUR marks. There will be negative marking on wrong answer. FOUR marks will be awarded for each correct answer and ONE mark will be deducted for each wrong answer. No marks will be deducted/awarded for unattempted questions.
4. Each multiple choice question has only one correct answer. More than one answer indicated against a question will be treated as incorrect answer.
5. Use of log table, mobile phones, any electronic gadget and slide rule etc. is strictly prohibited. Non-programmable calculator is permitted.
6. Candidate will be allowed to leave the examination hall at the end of examination time period only.
7. If a candidate is found in possession of books or any other printed or written material from which he/she might derive assistance, he/she is liable to be treated as disqualified. Similarly, if a candidate is found giving or obtaining (or attempting to give or obtain) assistance from any source, he/she is liable to be disqualified.
8. OMR sheet is placed within this paper and can be taken out from this paper but seal of paper must be opened only at the start of paper.
9. This booklet contains TWO Sections, Section A (Aptitude & Mathematics) has 30 Questions to be attempted and Section B (Subject domain) has 70 Questions to be attempted.

CSIT

Section - A :

General Aptitude : Q. 1 to Q. 15

Mathematics : Q. 16 to Q. 30

Section - B :

Computer Science & : Q. 31 to Q. 100
Information Technology

M. Tech.: Part A-(i) General Aptitude

- 001.** Antonym of word "Dissent" is:
(A) Renounce (B) Adopt
(C) Agree (D) Give
- 002.** Synonym of word "Impudent" is:
(A) Insolent (B) Partial
(C) Bankrupt (D) Restive
- 003.** Find out which part of the sentence has an error. If there is no mistake, the answer is 'No error'
(A) I have seen
(B) that film last year
(C) but I do not remember its story
(D) No error
- 004.** Chose the correct meaning of the phrase "To get into hot water":
(A) To be impatient
(B) To suffer huge financial loss
(C) To get into trouble
(D) To be in confused state of mind
- 005.** Find out the word with correct spelling:
(A) Brassere (B) Brissiere
(C) Brasiiere (D) Brassiere

006. The value of $25-5 [2+3\{2-2(5-3)+5\}-10]\div 4$ is
(A) 5 (B) 23.25
(C) 23.75 (D) 25.75

007. If the sum of a number and its square is 182, what is the number?
(A) 12 (B) 13
(C) 28 (D) 91

008. The sum of the ages of a father and his son is 45 years. Five years ago, the product of their ages was 34. The ages of the son and the father are respectively:
(A) 6 and 39 (B) 7 and 38
(C) 9 and 36 (D) 11 and 34

009. A number, when 35 is subtracted from it, reduces to its 80%. What is four fifth of that number?
(A) 70 (B) 90
(C) 120 (D) 140

010. If the ratio of areas of two circles is 4:9 then the ratio of their circumferences will be:
(A) 3:2 (B) 2:3
(C) 4:9 (D) 9:4

011. Army is related to Soldier as Galaxy is related to:
(A) Planet (B) Satellite
(C) Meteor (D) Star

012. IGH:TRS::?:KIJ
(A) POQ (B) QOP
(C) OPQ (D) QPO

013. '1+2+3' stands for the 'the brave boy' '2+3+4' stands for 'brave boy swims' '1+2+4+5' stands for 'the brave girl swims'. What stand for 'brave'?
(A) 1 (B) 2
(C) 3 (D) 4

014. Manipulate the symbol and find the missing number.
If $3*6=18$
 $4*7=22$
 $9*1=20$
then $5*2=?$
(A) 14 (B) 10
(C) 7 (D) 3

015. In a row of children, Kamal is sixth from the left and Appu is fourth from the right. When Kamal and Appu exchange positions, Appu becomes seventeenth from the right. Which will be Kamal's position from the left?
(A) Twentieth
(B) Nineteenth
(C) Twenty-first
(D) Seventh

016. If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, then

- (A) $A^2 = A^{-1}$ (B) $A^3 = A^{-1}$
 (C) $A^4 = A^{-1}$ (D) $A^5 = A^{-1}$

where A^{-1} is the inverse matrix of A .

017. The rank of the matrix

$$A = \begin{bmatrix} 1 & 1 & -1 & 1 \\ -1 & 1 & -3 & -3 \\ 1 & 0 & 1 & 2 \\ 1 & -1 & 3 & 3 \end{bmatrix} \text{ is}$$

- (A) 1 (B) 2
 (C) 3 (D) 4

018. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ then for every integer $n \geq 3$

- (A) $A^n = A^{n-2} + A^2 - I$
 (B) $A^n = A^{n-2} - A^2 + I$
 (C) $A^n = A^{n-3} + A^2 - I$
 (D) $A^n = A^{n-3} - A^2 - I$

where I is the identity matrix of order 3.

019. $\lim_{x \rightarrow 0} x \sin \frac{1}{x} =$

- (A) 0 (B) 1
 (C) ∞ (D) $-\infty$

020. If $f(x) = \begin{cases} x(e^{\frac{1}{x}} - e^{-\frac{1}{x}}), & x \neq 0, \\ 0, & x = 0 \end{cases}$ then

- (A) f is continuous and derivable at $x=0$
 (B) f is continuous but not derivable at $x=0$
 (C) f is discontinuous at $x=0$
 (D) f is derivable everywhere.

021. The sum of the series

$$1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots, \text{ is equal to}$$

- (A) $\frac{\pi^2}{4}$ (B) $\frac{\pi^2}{6}$
 (C) $\frac{\pi^2}{8}$ (D) $\frac{\pi^2}{12}$

022. The general solution of the partial differential equation

$$\left(\frac{y-z}{yz}\right) \frac{\partial z}{\partial x} + \left(\frac{z-x}{zx}\right) \frac{\partial z}{\partial y} = \frac{x-y}{xy}, \text{ is}$$

- (A) $\phi(xyz, x^2 + y^2 + z^2) = 0$
 (B) $\phi(xyz, xy + yz + zx) = 0$
 (C) $\phi(xyz, x + y + z) = 0$
 (D) $\phi(xyz, x^2y + y^2z + z^2x) = 0$

023. A unit vector normal to the surface

$$x^3 + y^3 + 3xyz = 3 \text{ at the point } (1, 2, -1) \text{ is}$$

- (A) $\frac{\hat{i} + 3\hat{j} + 2\hat{k}}{\sqrt{14}}$ (B) $\frac{-\hat{i} + 3\hat{j} + 2\hat{k}}{\sqrt{14}}$
 (C) $\frac{\hat{i} + 2\hat{j} + 3\hat{k}}{\sqrt{14}}$ (D) $\frac{-\hat{i} + 2\hat{j} + 3\hat{k}}{\sqrt{14}}$

- 024.** The vector field defined by $\vec{F} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k}$ is irrotational, if
- (A) $a=4, b=2, c=-1$
 (B) $a=4, b=-2, c=1$
 (C) $a=1, b=2, c=4$
 (D) $a=-1, b=4, c=2$.

- 025.** The value of $\oint_C (x^2 + xy)dx + (x^2 + y^2)dy$ where C is the square formed by the lines $y = \pm 1, x = \pm 1$, is equal to
- (A) 2π (B) 2
 (C) 1 (D) 0

- 026.** The only solution of the differential equation $x \frac{dy}{dx} - \frac{1}{2}y = x + 1$ for which x and y can attain the value unity is given by
- (A) $y = 2x - \sqrt{x} + 2$
 (B) $y = 2x + \sqrt{x} + 2$
 (C) $y = 2x + \sqrt{x} - 2$
 (D) $y = 2x + \sqrt{x} - 1$

- 027.** The Laplace transform of $e^x x^{\frac{1}{2}}$ is
- (A) $\frac{x}{\sqrt{s-1}}$ (B) $\frac{\sqrt{\pi}}{\sqrt{s-1}}$
 (C) $\frac{\sqrt{\pi}}{\sqrt{s+1}}$ (D) $\frac{\pi}{\sqrt{s+1}}$

- 028.** A die is tossed thrice. A success is getting 1 or 6 on a toss. Then the mean of the number of success is

- (A) $\frac{1}{2}$
 (B) $\frac{1}{3}$
 (C) $\frac{2}{3}$
 (D) 1

- 029.** A manufacturer knows that the condensers he makes contain on an average 1% of defectives. He packs them in boxes of 100. The probability that a box picked at random will contain 4 or more faulty condensers is

- (A) $1 - \frac{8}{3e}$
 (B) $1 - \frac{3}{8e}$
 (C) $1 - \frac{4}{3e}$
 (D) $1 - \frac{3}{4e}$

- 030.** The order of convergence of Newton Raphson method is

- (A) 0 (B) 1
 (C) 2 (D) 3

M.Tech : Part B
(Computer Science & Information Technology)

- 031** Let P be a quick sort program to sort numbers in ascending order using the first element as the pivot. Let t_1 and t_2 be the number of comparisons made by P for the inputs [1 2 3 4 5] and [4 1 5 3 2], respectively. Which one of the following holds?
- (A) $t_2 = 5$ (B) $t_1 > t_2$
(C) $t_1 < t_2$ (D) $t_1 = t_2$
- 032** $f(n) = 5 \log n + 3 \log \log n$ is
- (A) $\Theta(\log n)$ (B) $\Theta(\log \log n)$
(C) $\Theta(n)$ (D) $\Theta(1)$
- 033** The worst-case time complexity of AVL tree is better in comparison to binary search tree for
- (A) Search and Insert operations
(B) Search and Delete operations
(C) Insert and Delete operations
(D) Search, Insert, and Delete operations
- 034** Which statement is true?
- (A) If a dynamic-programming problem satisfies the optimal-substructure property, then a locally optimal solution is globally optimal
(B) If a greedy choice property satisfies the optimal-substructure property, then a locally optimal solution is globally optimal
(C) Both of above
(D) None of above
- 035** Which of the following is true about Kruskal and Prim MST algorithms? Assume that Prim is implemented for adjacency list representation using Binary Heap and Kruskal is implemented using union by rank.
- (A) Worst case time complexity of both algorithms is same
(B) Best case time complexity of both algorithms is same
(C) Worst case time complexity of Kruskal is better than Prim
(D) Worst case time complexity of Prim is better than Kruskal
- 036** What are the time complexities of inserting a node at front and end of a circular linked list, respectively? Assume the size of the linked list is n.
- (A) $O(1)$ and $O(1)$
(B) $O(1)$ and $O(n)$
(C) $O(n)$ and $O(1)$
(D) $O(n)$ and $O(n)$
- 037** Let X be a text string with n characters from an alphabet of size d. We can perform pattern matching queries on X in $O(dm)$ time, where m is the length of the pattern, with the suffix trie of X, which uses _____ space and can be constructed in _____ time.
- (A) $O(n)$ and $O(dn)$
(B) $O(dn)$ and $O(n)$
(C) $O(n)$ and $O(n/d)$
(D) $O(n/d)$ and $O(n)$

- 038** Which of the following is correct recurrence for worst case of Binary Search?
- (A) $T(n) = 2T(n/2) + O(1)$ and $T(1) = T(0) = O(1)$
 (B) $T(n) = T(n-1) + O(1)$ and $T(1) = T(0) = O(1)$
 (C) $T(n) = T(n/2) + O(1)$ and $T(1) = T(0) = O(1)$
 (D) $T(n) = T(n-2) + O(1)$ and $T(1) = T(0) = O(1)$
- 039** If $f(n)$ is a polynomial of degree d (that is, $f(n) = a_0 + a_1n + a_2n^2 + \dots + a_dn^d$) and $a_0, a_1, a_2, \dots, a_d > 0$, then $f(n)$ is
- (A) $O(1)$ (B) $O(n)$
 (C) $O(d^n)$ (D) $O(n^d)$
- 040** For all integers a and b and any non-negative integer n ,
- (A) $\gcd(an, bn) = \gcd(a, b)$
 (B) $\gcd(an, bn) = n \gcd(a, b)$
 (C) $\gcd(a, b) = n \gcd(an, bn)$
 (D) $\gcd(a, b) = ab \gcd(a, b)$
- 041** Choose the correct answer for the following statements:
- I. The theory of NP-completeness provides a method of obtaining a polynomial time for NP algorithms.
 II. All NP-complete problem are NP-Hard.
- (A) I is FALSE and II is TRUE
 (B) I is TRUE and II is FALSE
 (C) Both are TRUE
 (D) Both are FALSE
- 042** An undirected graph G with n vertices and e edges is represented by adjacency list. What is the time required to generate all the connected components?
- (A) $O(n)$ (B) $O(e)$
 (C) $O(n + e)$ (D) $O(e^2)$
- 043** Consider the Fibonacci sequence $F(1) = 1, F(2) = 2$, and $F(n) = F(n-1) + F(n-2)$ for $n > 2$. Then
- (A) $F(n) < n \log n$ (B) $F(n) < n^2$
 (C) $F(n) < n^3$ (D) $F(n) < 2^n$
- 044** A set of n line segments may contain
- (A) $\Theta(n)$ intersection
 (B) $\Theta(n \log n)$ intersection
 (C) $\Theta(n^2)$ intersection
 (D) $\Theta(n^3)$ intersection
- 045** Ford-Fulkerson algorithm is used for
- (A) Single source-single destination shortest path calculation
 (B) Single source - multiple destination shortest path calculation
 (C) All pair shortest path calculation
 (D) Maximum flow calculation in a network
- 046** Which of the following standard algorithms is not a Greedy algorithm?
- (A) Dijkstra's shortest path algorithm
 (B) Prim's algorithm
 (C) Huffman Coding
 (D) Bellmen Ford Shortest path algorithm

047 What is the time complexity of fun()?

```
int fun(int n)
{
    count = 0;
    for(int i = n; i > 0; i /= 2)
        for(int j = 0; j < i; j++)
            {
                count = count + 1;
            }
    return count;
}
```

- (A) $O(\log n)$ (B) $O(n)$
(C) $O(n \log n)$ (D) $O(n^2)$

048 Consider the following infix expression: $4 + 3 * (6 * 3 - 12)$. Suppose, a usual stack algorithm is used to convert the expression from infix to postfix notation. The maximum number of symbols that will appear on the stack AT ONE TIME during the conversion of this expression?

- (A) 1 (B) 2
(C) 3 (D) 4

049 Given a graph $G = (V, E)$, the problem is to partition the vertex set into two sets (A, B).

An edge is said to be cut by this partition

- (A) if its endpoints lie on different sides of the partition
(B) if its endpoints lie on same sides of the partition
(C) if its all vertices are connected
(D) if its all vertices are disjoint

050 A one-way hash function H maps a string (message) M of arbitrary length to an integer $d = H(M)$ with a fixed number of bits, called the digest of M. Which property is true for one way-hash function

- I. Given a string M, the digest of M can be computed quickly.
II. Given the digest d of M, but not M, it is computationally infeasible to find M.

- (A) I is True and II is False
(B) I is False and II is True
(C) Both I and II are True
(D) Both I and II are False

051 Which of the following statements is correct about the below code?

```
maruti.engine.bolts=25;
```

- (A) Structure bolts is nested within structure engine.
(B) Structure engine is nested within structure maruti.
(C) Structure maruti is nested within structure engine.
(D) Structure maruti is nested within structure bolts.

052 Which header file should be included to use functions like malloc() and calloc() in C programming?

- (A) memory.h
(B) stdlib.h
(C) dynamic.h
(D) string.h

053 Which of the following statements are correct about the below declarations?

```
char *p = "Sanjay";
```

```
char a[] = "Sanjay";
```

- I) There is no difference in the declarations and both serve the same purpose.
 - II) p is a non-const pointer pointing to a non-const string, whereas a is a const pointer pointing to a non-const pointer.
 - III) The pointer p can be modified to point to another string, whereas the individual characters within array a can be changed.
 - IV) In both cases the '\0' will be added at the end of the string "Sanjay".
- (A) I, II (B) II, III
(C) III, IV (D) None of the above

054 What is the difference between exit(0) and return 0 in the main function of a C program?

- (A) no difference
- (B) return 0 exits the function and exit(0) exits the program
- (C) exit(0) gives an error
- (D) return 0 gives an error

055 What does the following declaration mean in C programming language?

```
int (*ptr)[10];
```

- (A) ptr is array of pointers to 10 integers
- (B) ptr is a pointer to an array of 10 integers
- (C) ptr is an array of 10 integers
- (D) ptr is a pointer to array

056 What is (void *)0 in C?

- (A) representation of a null pointer
- (B) representation of void pointer
- (C) representation of a pointer to a pointer
- (D) none of the above

057 Which of the following is not logical operator in C programming language?

- (A) ! (B) &&
- (C) || (D) &

058 In C, if you pass an array as an argument of a function, what actually gets passed?

- (A) values of elements in the array
- (B) first element of the array
- (C) base address of the array
- (D) none of the above

059 Does an object of the child class have memory allocated for the private data members of the parent class?

- (A) never
- (B) sometimes
- (C) depends on inheritance type
- (D) always

060 Which of the following functions in C programming language is used to find the first occurrence of a given string in another string?

- (A) strchr() (B) strrchr()
- (C) strstr() (D) strnset()

- 061** Let $L = \{w\#x \mid x \text{ has a substring which is reversal of } w, \text{ where } w \text{ and } x \text{ are strings defined over the alphabet set } \{a, b\}\}$.
- (A) L is regular.
 (B) L is both regular and context free.
 (C) L is not regular but context free.
 (D) L is not regular and not context free.
- 062** Which of the following is incorrect about regular languages?
- (A) Union of regular languages is commutative.
 (B) Union of regular languages is associative.
 (C) Concatenation of regular language is commutative.
 (D) None of the above
- 063** Consider the GoBackN protocol with a sender window size of 7 and a sequence number range of 1, 024. Suppose that at time t , the next in-order packet that the receiver is expecting has a sequence number of K . Which of the following is a valid sequence number group at the sender assuming that the medium does not reorder messages.
- (A) $(K-7, K-6, K-5, K-4, K-3, K-2, K-1)$
 (B) $(K+6, K+5, K+4, K+3, K+2, K+1, K)$
 (C) Both A and B.
 (D) Neither A nor B.
- 064** Pseudoheader in UDP is used for the following reasons:
- (A) To provide protection against misrouted datagrams
 (B) For checksum calculations
 (C) To protect the real header
 (D) Both A and B
- 065** WAN stands for
- (A) Wap Area Network
 (B) Wide Area Network
 (C) Wide Array Net
 (D) Wireless Area Network
- 066** Hosts A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, If the second segment arrives before the first segment, in the acknowledgement of the first arriving segment to B, what is the acknowledgment number?
- (A) 246 (B) 127
 (C) 167 (D) 206
- 067** What is the time complexity of Huffman Coding?
- (A) $O(n)$
 (B) $O(n \log n)$
 (C) $O(n (\log n)^2)$
 (D) $O(n^2)$

- 068** How to resolve a shift-shift conflict in a shift-reduce parsing algorithm?
 (A) Ignore the conflict and continue the algorithm
 (B) Choose one of the shift actions randomly
 (C) Rewrite the grammar to avoid the shift-shift conflicts
 (D) We cannot use the grammar for parsing
- 069** What is the time complexity (w.r.t. the number of tokens) of the fastest algorithms for parsing any arbitrary context-free grammar?
 (A) Linear (B) Quadratic
 (C) Cubic (D) Quartic
- 070** Which of the following grammars is/are unambiguous:
 (1) $S \rightarrow SS|(S)|\epsilon$ (2) $S \rightarrow S(S)S|\epsilon$
 (3) $S \rightarrow S(S)|\epsilon$ (4) $S \rightarrow (S)S|\epsilon$
 (A) 1,2, 3, 4 (B) 2, 3, 4
 (C) 3, 4 (D) 4
- 071** Let L be a language defined on {a, b} and consisting of strings such that number of occurrences of “ab” is equal to occurrences of “ba”. Then
 (A) L is a regular language
 (B) L is not a regular language but a context-free language
 (C) L is not a context-free language but a context-sensitive language
 (D) L is not a context-sensitive language
- 072** Which of the following memories needs refresh?
 (A) DRAM
 (B) SRAM
 (C) ROM
 (D) All of above
- 073** MS JK Flip-Flop is equivalent to:
 (A) JK Flip-Flop
 (B) SR Flip-Flop
 (C) Negative edge-triggered Flip-Flop
 (D) Positive edge-triggered Flip-Flop
- 074** Which of the following requires a device driver?
 (A) Register
 (B) Cache
 (C) Main memory
 (D) Disk
- 075** Which of the statements are correct?
 (A) Moore and Mealy machines are computationally equivalent.
 (B) Moore machine is computationally more powerful than Mealy machine.
 (C) Mealy machine is computationally more powerful than Moore machine.
 (D) None of the above.

- 076** When a top-down approach of dynamic programming is applied to a problem, it usually
- (A) Decreases both, time complexity and space complexity
 - (B) Increases time complexity and decreases space complexity
 - (C) Decreases time complexity and increases space complexity
 - (D) Increases both, time complexity and space complexity
- 077** Which of the following problems is known to have a polynomial time solution?
- (A) Longest Simple Path problem for a given graph
 - (B) Linear Programming Problem
 - (C) Integer Linear Programming Problem
 - (D) Hamiltonian Cycle problem
- 078** Which of the following basic algorithms can be used to most efficiently determine the presence of a cycle in a given graph?
- (A) Spanning Tree Algorithm
 - (B) Depth First Search Algorithm
 - (C) Breadth-first search algorithm
 - (D) None of the above
- 079** The problem 3-SAT and 2-SAT are
- (A) both in P
 - (B) both NP complete
 - (C) NP-complete and in P respectively
 - (D) Undecidable and NP-complete respectively
- 080** Which of the following problems is NOT solved using dynamic programming?
- (A) 0/1 Knapsack problem
 - (B) Matrix chain multiplication problem
 - (C) Edit distance problem
 - (D) Fractional Knapsack problem
- 081** Which statement is true about clique decision problem
- I. clique problem is in NP
 - II. 3-SAT problem is reducible to clique problem in polynomial time
- (A) Statement I is true and Statement II is false
 - (B) Statement II is true and Statement I is false
 - (C) Both Statement I and Statement II are true
 - (D) Both Statement I and Statement II are false
- 082** What are appropriate data structures for the following algorithms:
- 1) Breadth First Search
 - 2) Depth First Search
 - 3) Prim's Minimum Spanning Tree
 - 4) Kruskal's Minimum Spanning Tree
- (A) 1) Stack, 2) Queue, 3) Priority Queue, 4) Union Find
 - (B) 1) Queue, 2) Stack, 3) Priority Queue, 4) Union Find
 - (C) 1) Stack, 2) Queue, 3) Union Find, 4) Priority Queue
 - (D) 1) Priority Queue, 2) Queue, 3) Stack, 4) Union Find

083 If there are 'n' processes in a system, with the time-quantum less than the CPU burst times of all these processes in a given round, then the number of preemptions is at least:

- (A) $2n$ (B) n
(C) $2n-1$ (D) $n-1$

084 A thread is usually defined as a 'light weight process' because an operating system (OS) maintains smaller data structures for a thread than for a process. In relation to this, which of the followings is TRUE?

- (A) On per-thread basis, the OS maintains only CPU register state
(B) The OS does not maintain a separate stack for each thread
(C) On per thread basis, the OS maintains only scheduling and accounting information
(D) On per-thread basis, the OS does not maintain virtual memory state

085 Consider the program involving fork() system call given below.

```
#include<stdio.h>
#include<unistd.h>
int main()
{
    fork() && fork();
    printf("forked");
    return 0;
}
```

How many processes get spawned after executing the above program?

- (A) at most 3 (B) 8
(C) 4 (D) 16

086 Consider a virtual memory system with FIFO page replacement policy. For an arbitrary page access pattern, increasing the number of page frames in main memory will

- (A) Always decrease the number of page faults
(B) Always increase the number of page faults
(C) Sometimes increase the number of page faults
(D) Never affect the number of page faults

087 In demand paging:

- (A) There is external fragmentation
(B) There is no internal fragmentation
(C) There is no external fragmentation
(D) None of the above

088 Consider the systems, each consisting of m linear equations in n variables.

- I. If $m < n$, then all such systems have a solution
II. If $m > n$, then none of these systems has a solution
III. If $m = n$, then there exists a system which has a solution

Which one of the following is CORRECT?

- (A) I, II and III are true
(B) Only II and III are true
(C) Only III is true
(D) None of them is true

- 089** The following simultaneous equations, $x + y + z = 3$, $x + 2y + 3z = 4$, $x + 4y + kz = 6$ will not have a unique solution for k equals to
 (A) 0 (B) 5
 (C) 6 (D) 7
- 090** What is the minimum number of students required in a class to be sure that at least six will receive the same grade, if there are five possible grades, A, B, C, D, and F ?
 (A) 27 (B) 28
 (C) 30 (D) 26
- 091** A body originally at 60°C cools down to 40°C in 15 minutes when kept in air at a temperature 25°C . What will be the temperature of the body at the end of 30 minutes?
 (A) 35.2°C (B) 31.5°C
 (C) 28.7°C (D) 15°C
- 092** Which of the following statements is logically equivalent to $\neg\forall x\forall y(p(x, y) \rightarrow q(x, y))$ for the propositional variables x and y , and binary predicates $p(x, y)$ and $q(x, y)$?
 (A) $\exists x\exists y (p(x, y) \wedge \neg q(x, y))$
 (B) $\exists x\exists y (p(x, y) \vee \neg q(x, y))$
 (C) $\exists x\forall y (p(x, y) \wedge \neg q(x, y))$
 (D) $\exists x\forall y (p(x, y) \vee \neg q(x, y))$
- 093** What is the probability that a positive integer selected at random from the set of positive integers not exceeding 100 is divisible by either 2 or 5?
 (A) $3/5$ (B) $2/5$
 (C) $1/5$ (D) $3/4$
- 094** Let G be a connected graph with $|G| \geq 2$ and let v be a vertex in G . If $G \setminus \{v\}$ is connected, then,
 (A) $\text{deg}(v) = 1$
 (B) v is on a cycle
 (C) either $\text{deg}(v) = 1$ or v is on a cycle
 (D) both $\text{deg}(v) = 1$ and v is on a cycle
- 095** For a scalar function $f(x, y, z) = x^2 + 3y^2 + 2z^2$, the gradient at the point $P(1, 2, -1)$ is ____
 (A) $2i + 6j + 4k$ (B) $2i + 12j - 4k$
 (C) $2i + 12j + 4k$ (D) $\sqrt{56}$
- 096** If the standard deviation of the spot speed of vehicles in a highway is 8.8 kmph and the mean speed of the vehicles is 33 kmph, the coefficient of variation in speed is ____
 (A) 0.1517 (B) 0.1867
 (C) 0.2666 (D) 0.3446

097 There are two containers, one containing 4 red and 3 green balls and the other containing 3 blue and 4 green balls. One ball is drawn at random from each container. The probability that one of the balls is red and the other is blue will be

- (A) $1/7$ (B) $9/49$
(C) $12/49$ (D) $3/7$

098 Consider a function $f(x) = 1 - |x|$ on $-1 \leq x \leq 1$. The value of x at which the function attains a maximum and the maximum value of the function are:

- (A) 0, -1 (B) -1, 0
(C) 0, 1 (D) -1, 2

099 Which of the following relations is a total order?

- (A) Less than
(B) Less than or equal to
(C) Divides
(D) Subset

100 Recurrence relation for Strassen Matrix multiplication is

- (A) $T(n) = 7T(n/2) + \Theta(n^2)$
(B) $T(n) = 7T(n-1) + \Theta(n^2)$
(C) $T(n) = 7T(n/2) + \Theta(n)$
(D) $T(n) = 2T(n-1) + \Theta(n)$

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