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Branch: Computer Science and Information Technology MOCK-E- SOLUTIONS

01. Ans: (d)			$[1] = \{1\}$				
Sol: The given statement can be written as,			$[2] = \{2, 3, 4\}$				
$\exists_x \{ R(x) \land$	$\sim \sim S(x)$		$[3] = \{2, 3, 4\}$				
Now, $\sim [\exists_x$	$\{R(x) \land \neg S(x)\}]$		$[4] = \{2, 3, 4\}$				
$\Leftrightarrow \forall$	$\int_{\mathbf{x}} \{ \sim \mathbf{R}(\mathbf{x}) \lor \mathbf{S}(\mathbf{x}) \}$						
$\Leftrightarrow \forall$	$J_x \{ R(x) \rightarrow S(x) \}$		06. Ans: (a)				
: Option	(d) is correct.		Sol: ACK is the next byte expected. So, up				
-			receiving 999 bytes, it gives 1000.				
02. Ans: (d)							
Sol: The gra	mmar is Ambi	guous and no	07. Ans: (c)				
ambiguous	grammar is LR(F	K).	Sol: Max file size = (Total number of blocks) *				
			Disk block size				
03. Ans: (d)			= (10 + 32 + 2*1024) * 64 B				
Sol: Both $A \rightarrow$	B and $B \rightarrow A$ im	plied on R ₁ (AB)	= 2090 * 64 Bytes				
and BC \rightarrow	D implied on R ₂	(BCD).	08. Ans: (c)				
			Sol: int(*p)(int*) :				
04. Ans: (d)			Syntax pointer to function is for declaration				
Sol:		1	of				
Merge	$O(n \log n)$		return type (*ptr variable)				
Insertion	$O(n^2)$		(List of arguments):				
Bubble	$O(n^2)$		(,,				
Heap	O(n log n)		09. Ans: (d)				
Quick	O(n ²)		Sol· $\mathbf{V} = \overline{A}\overline{B}\overline{C}(0) + \overline{A}\overline{B}C(D) + \overline{A}\overline{B}\overline{C}(1) + \overline{A}\overline{B}C(0) +$				
Selection	n $O(n^2)$		$\overline{ABC}(D) + \overline{ABC}(D) + \overline{ABC}(1) + \overline{ABC}(0)$				
			$Y = \Sigma m(3, 4, 5, 9, 11, 12, 13)$				
05. Ans: (a)							
Sol: $R = \{(1, 1)\}$, (2, 2), (2, 3), (2,	4), (3, 2), (3, 3),	10. Ans: (d)				
(3, 4), (4, 2	$\{2, (4, 3), (4, 4)\}$		Sol: we have $f(1) = f(2) = 50$				
R is an equ	ivalence relation		\Rightarrow f is not one-to-one				
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CSIT

In the co-domain, the integers 1, 2, 3..... 49 are not mapped by any integers of the domain.

 \Rightarrow f is not on-to

11. Ans: (d)

Sol: Every LL(1) grammar is LR(1) but every LR(1) need not be LL(1)

12. Ans: 7

Sol: Length of string w = 4 = |w|No. of steps $= 2 \times |w| - 1 = 2 \times 4 - 1 = 7$

13. Ans: 8.8

Sol: $T_{seg} = 4ns$ Total time = $(0.7 \times 1 \times 4ns) + (0.3 \times (1+4) \times 4ns)$ \downarrow stall delay = 2.8ns + 6ns = 8.8ns

14. Ans: (b)

Sol: In the outer for loop, the variable 'i' keeps halving so it goes round log₂n times.

For each 'i', next for loop goes round also $\log_2 n$ times because of doubling the variable 'j'.

The innermost loop by k goes round $\frac{n}{2}$ times. Loops are nested, so the bounds may be multiplied to given that the algorithm is $O(n(logn)^2)$.

- 15. Ans: (a)
- Sol: $\begin{bmatrix} 2 & 6 & 7 \end{bmatrix}_8$

Y X

i) $7_8 + 6_8 = (13)_8 = (8 + 5)_8 = (5)_8$ with carry = 1, hence X = 5 ii) 6 + X + 1 = 6 + 5 + 1 = 12 = 8 + 4 = 4with carry 1, hence Y = 4 iii) 2 + Y + 1 = 2 + 4 + 1 = 7 \Rightarrow Hence Z = 7

16. Ans: (c)

Sol: The characteristic equation is $|A - \lambda I| = 0$

 $\Rightarrow \lambda = 4, 4$ The eigen vectors for $\lambda = 4$ are given by [A - 4I] X = 0 $\Rightarrow x - y = 0$ $\Rightarrow X = k \begin{bmatrix} 1\\ +1 \end{bmatrix}$ where k is non zero

arbitrary constant.

17. Ans: (d)

Sol: Transaction T_3 performs read on A, which is updated by T_1 and committed before T_1 does.

18. Ans: (d)

Sol: Deadlock may occur under basic 2PL

19. Ans: (d)

Sol: p = &a[2][2][2] we declare only two 2D arrays, but we are trying to access the third 2D(which are not declared) it will print garbage values. *q=***a starting address of a is assigned integer pointer. Now q is pointing to starting address of a. If you print *q it will print first element of 3D array.

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20. Ans: (d)

Sol: The grammar is not LL(1), LR(0), SLR (1) and LR(1) as it has Reduce-Reduce conflict.

21. Ans: 8

Sol: By sum of degrees theorem, (5+2+2+2+2+1) = 2 |E| $\Rightarrow |E| = 7$ \therefore Number of edges in G = 7 $|E(G)| + |E(\overline{G})| = |E(K_6)|$ $\Rightarrow 7 + |E(\overline{G})| = C(6, 2)$ $\Rightarrow |E(\overline{G})| = 8$

22. Ans: 159

Sol: /27 clearly indicates that first 3 bits (128, 64, 32) in the last octet are borrowed for subnet, 5 bits for Host ID and mask is 255.255.255.254. If you perform AND operation between IP (200.10.11.144) and Subnet mask (255.255.255.224) then we get 200.10.11.128. So subnet ID is 128 and network ID is 200.10.11.

We have 5 bits for host ID. We cannot have all 1's in host ID, therefore we will have 11110 (last 5 bits) for the last IP address. Therefore in last octet we will have 10011110, it is 158.

Last Broadcast ID we have 10011111, it is 159.

23. Ans: 8

Sol: $F(A,B,C,D) = A \oplus B \oplus C \oplus D$

XOR is an odd function. Number of 1's are odd then XOR output is 1

 $F (A,B,C,D) = A \oplus B \oplus C \oplus D$ $= \sum m (1, 2, 4, 7, 8, 11, 13, 14)$ hence number of SSOP terms are 8

24. Ans: (a)

Sol: R.I.S.C uses Hardwired control unit (CU) Hardwired C. U. is faster than Horizontal and vertical control word units.Modification in Hardwired control unit is not possible.

25. Ans: (b)

Sol: n-bit magnitude comparator condition for

A > B is

$$\Rightarrow \frac{2^{2 \times n} - 2^{n}}{2} \text{ Here } n = 8$$

$$\Rightarrow \frac{2^{2 \times 8} - 2^{8}}{2} = \frac{2^{16} - 2^{8}}{2} = \frac{2^{8} [2^{8} - 1]}{2}$$

$$= 2^{7} [256 - 1] = 255 \times 2^{7}$$

26. Ans: (a)

Sol: Only the statement a = a-5 is part of the if statement, the statement b = b + 5 will always be executed. If we want the statement b = b + 5 to become part of if statement then we need to enclose both statements within braces.

27. Ans: 740

Sol: Payload length = Total length – (HLEN * 5) = 800 - (12 * 5) = 740

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28. Ans: (d)

- **Sol:** R-R conflict occurs in LR(0), LALR(1) and conflict possible in LL(1)
- 29. Ans: (c)

30. Ans: (c)

Sol: In IPV₄ datagram offset value is non zero and M (More Fragment) bit is one, then the position of datagram is Intermediate Fragment.

31. Ans: (c)

- **Sol: Example:** For MOD-16 \Rightarrow N = 16
 - (a) $N = 2^m = 16 = 2^4 \implies m =$ number of Flip-Flops = 4
 - (b) For BCD \Rightarrow N = 10 \Rightarrow m $\geq \log_2 N \Rightarrow$ hence m = 4
 - (c) MOD-16 Ring counter need 16 Flip-Flops
 - (d) 16-bit Johnson counter requires = $\frac{N}{2} = \frac{16}{2} = 8$ Flip-Flops

32. Ans: (c)

Sol: For each value of 'i', the loop 'j' will run "logn" time and loop 'k' will run loglogn time.

Since the outer loop 'i' is running 'n' times so the loop 'j' will run nlogn time and loop 'k' will run nloglogn time.

 \therefore Time Complexity = nlogn + nloglogn

= O(nlogn)

33. Ans: (c)

Sol: True dependency is also known as Read After Write (RAW)

34. Ans: (b)

Sol: As we get key and participation constraint from course to registration, therefore the number of tuples in registration will be equal to the tuples in the course table.

35. Ans: (c)

Sol: Let x be any person,

P(x) = x is a politician and Q(x) = x is a sports person

S₁: Whenever L.H.S is true, we have R.H.S is also true and vice versa

 \therefore S₁ is true.

S₂: If the universe of discourse contain one politician and one sports person then L.H.S is true and R.H.S is false.

 \therefore S₂ is not valid

S₃: If the universe of discourse contain one politician and one sportsman.

For ex. U = {Rahul Gandhi, Virat Kohli} then R.H.S is true and L.H.S is false

 \therefore L.H.S \Leftrightarrow R.H.S

S₄: Whenever L.H.S is true, we have R.H.S is also true, and vice versa

 \therefore S₄ is true

36. Ans: (d)

Sol: First 'i' is global Second and third i are local Third 'i' visible within the block

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38. Ans: (a)

Sol: Before subnetting maximum possible number of hosts = (2^8-2) hosts = 254 hosts After subnetting maximum possible number of hosts = $(2^3 - 2) * (2^5 - 2)$ hosts = 6 * 30 hosts = 180 hosts Reduction value = 254 - 180 = 74 hosts

39. Ans: (b)

Sol: $A+B^{*}(C+D)/F+D^{*}E$ $A+B^{*}(+CD)/F+D^{*}E$ $A+(^{*}B+CD)/F+(^{*}DE)$ $A+(/^{*}B+CDF)+(^{*}DE)$ $(+A/^{*}B+CDF)+(^{*}DE)$ $++A/^{*}B+CDF^{*}DE$

40. Ans: (c) Sol:



		1	1			
	2	3	4	5	6	7
$S = \{1\}$	5*	×	10	8	8	8
$S = \{1, 2\}$	5*	15	10*	8	8	8
$S = \{1, 2, 4\}$	5*	15*	10*	15	8	8
S = {1, 2, 4, 3}	5*	15*	10*	15*	×	35
$S = \{1, 2, 4, 3, 5\}$	5*	15*	10*	15*	25*	35
S= {1, 2, 4, 3, 5, 6}	5*	15*	10*	15*	25*	35*
S={1, 2, 4, 3, 5, 6, 7}	5*	15*	10*	15*	25*	35*

41. Ans: (b)

Sol: Both $B \rightarrow F$ and $E \rightarrow B$ are transitive dependencies then the relation is in 2NF.

42. Ans: (a)

Sol: Pre-order = f, d, c, b, a, e, j, h, g, i, *l*, o In-order = a, b, c, d, e, f, g, h, i, j, *l*, o



Post-order = a, b, c, e, d, g, i, h, o, *l*, j, f

43. Ans: 7

Sol: The DFA for L^1 is obtained by interchanging final and Non-final states. So number of final states in the DFA that accepts L^1 is 10-3 = 7

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44. Ans: 56

Sol: If G is a bipartite graph with n vertices then

$$|\mathbf{E}| \le \left\lfloor \frac{\mathbf{n}^2}{4} \right\rfloor \text{ where } \mathbf{n} = 15$$
$$\Rightarrow |\mathbf{E}| \le \left\lfloor \frac{225}{4} \right\rfloor \Rightarrow |\mathbf{E}| \le 56$$

 \therefore Maximum number of edges possible = 56

45. Ans: (d)

Sol: $\eta_{\text{stop & wait}} = \frac{\text{tx}}{\text{RTT}} \left| \eta_{\text{sliding window}} = \frac{\text{N} * \text{tx}}{\text{RTT}} \right|$ $\eta_{\text{stop & wait}} = \frac{1}{N} * \eta_{\text{sliding window}}$ $\left[\eta_{\text{sliding window}} = 1, \text{ When N} = 5 \right]$ $\eta_{\text{stop & wait}} = \frac{1}{5} = 20\%$

46. Ans: 4

Sol: After every three consecutive bits sender stuff a zero bit

 $\underbrace{\begin{array}{c} 011110 \\ \text{Start} \end{array}}_{\text{Start}} 01110 011101011011100110 011110 \\ \uparrow \uparrow \uparrow \uparrow \\ \text{Delimiter} \end{array} \underbrace{\begin{array}{c} 011110 \\ \text{End} \\ \text{Delimiter} \end{array} }_{\text{Delimiter}}$

47. Ans: (b)

Sol: The time complexity of kruskals algorithm

for G(V, E)
= O(ElogE)
=
$$\frac{V(V-1)}{2}\log \frac{V(V-1)}{2}$$

[In complete graph G(V, E), $|E| = \frac{V(V-1)}{2}$]

$$= \left(\frac{V^2 - V}{2}\right) \log \frac{V(V - 1)}{2}$$
$$= \frac{V^2 - V}{2} \log \frac{V^2}{V} - \frac{V^2 - V}{2} \log \frac{V}{2} \cong \left(V^2 \log V\right)$$

48. Ans: 10

Sol: j = ((((2 * 3) / 4) + (2.0/5)) + (8/5))

After evaluating above expression we have

- j = 2 k = − 1 when i = 0, i+k=−1→1 time printf statement executed i = 1, i+k=0→1 time printf statement executed i = 2, i+k=1→ 3 times printf statement executed i = 3, i+k=2→ 3 times printf statement executed i = 4, i+k=3→ 2 times printf statement executed
 - : Total 10 times printf statement executed

49. Ans: 32

Sol: The Hasse diagram of the poset is 4-cube. Number of edges in n-cube = $n.2^{n-1}$ \therefore Number of edges in the Hasse diagram = 4. $2^{4-1} = 32$

50. Ans: (d)

Sol: Page table entry of outer table = 32 bits Page table entry of inner table = 64 bits Frame size = 4 KB Number of frames = 128 MB/4 KB= 2^5 . $2^{10} = 2^{15}$ Size of outer page table = $(2^{13} \times 2^5)/8 = 32$ KB

Size of inner page table= $(2^{14} \times 2^6)/8 = 128$ KB

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51. Ans: (d)

Sol:
$$\mathbf{J}_1 = \overline{\mathbf{Q}}_2, \ \mathbf{J}_2 = \mathbf{Q}_1, \ \mathbf{Z} = \overline{\mathbf{Q}}_0 \ \overline{\mathbf{Q}}_1 \ \overline{\mathbf{Q}}_2$$

The state table is as shown below.

Clk			Inp	Outputs			7			
	J ₀	K ₀	\mathbf{J}_1	K ₁	J_2	K ₂	Q ₀	Q_1	Q_2	
0	-	-	-	-	-	-	0	0	0	1
1	1	1	1	1	0	1	1	1	0	0
2	1	1	1	1	1	1	0	0	1	0
3	1	1	0	1	0	1	1	0	0	0
4	1	1	1	1	0	1	0	1	0	0
5	1	1	1	1	1	1	1	0	1	0
6	1	1	0	1	0	1	0	0	0	1

Hence output becomes high after every 6 clock pulses.

52. Ans: (b)

53. Ans: 10

Sol:

Bottom-up evaluation of parse tree outputs 10.

54. Ans: (b)

Sol: Let $A = \begin{bmatrix} a & b \\ b & c \end{bmatrix}$

If λ is eigen value of A and X is the corresponding eigen vector then, $AX = \lambda X$

For $\lambda = 1$, we have $\begin{bmatrix} a & b \\ b & c \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix} = 1 \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ $\Rightarrow a + b = 1 \dots (1)$ and $b + c = 1 \dots (2)$ For symmetric matrix, the eigen vectors of A are orthogonal. The eigen vector for $\lambda = 4$ is (1, -1)Now, $AX = \lambda X$ becomes $\begin{bmatrix} a & b \\ b & c \end{bmatrix} \begin{bmatrix} 1 \\ -1 \end{bmatrix} = 4 \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ $\Rightarrow a - b = 4 \dots (3)$ $\Rightarrow b - c = -4 \dots (4)$ solving (1), (2), (3) and (4), we get $a = \frac{5}{2}, \ b = \frac{-3}{2} \text{ and } c = \frac{5}{2}$ $\therefore A = \frac{1}{2} \begin{bmatrix} 5 & -3 \\ -3 & 5 \end{bmatrix}.$

55. Ans: 47550

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We can have less number of block nested loop join's for accessing blocks, if the relation which has less number of records in the outer loop.

- ∴ Total block accesses in block nested loop join
 - $= N_S \times B_R + B_S B_S \times B_R + B_S$ $= 500 \times 100 + 25 25 \times 100 + 25$ = 47550

56. Ans: (c)

Sol: (passive voice - verb in past participle form)

57. Ans: (c)Sol: 'between.... to' is wrong. 'between.....and'.

58. Ans: (d)

Sol: Suggestion is friendly/ smooth Demand is unfriendly/Rough Take is smooth Grab is Rough

59. Ans: (c)

Sol: Let the four numbers be x, x + 2, x + 4, and x + 6. $\Rightarrow x + x + 2 + x + 4 + x + 6 = 36$ $\Rightarrow 4x + 12 = 36$ $\Rightarrow x = 6$ Therefore, the numbers are 6, 8, 10 & 12.

Therefore, the sum of their squares $= 6^2 + 8^2 + 10^2 + 12^2 = 36 + 64 + 100 + 144 = 344.$

60. Ans: (a)

Sol: We know that an ordinary year has 1 odd day and a leap year has 2 odd days. During this period, namely 2005, 2006, 2007, 2008, 2009, 2010. Total number of odd days = (1 + 1 + 1 + 2 + 1 + 1)days = 7 = 0 odd days. Hence, the calendar for 2005 will serve for the year 2011 too.

61. Ans: (d)

Sol: The solution to this problem can be obtained only with more information like ratio of the length of the rectangle to its breadth.

62. Ans: (b)

Sol: Amount =
$$\begin{bmatrix} 7500 \times \left(1 + \frac{4}{100}\right)^2 \end{bmatrix}$$
$$= \left(7500 \times \frac{26}{25} \times \frac{26}{25}\right)$$
$$= 8112$$
So, compound interest = (8112 - 7500) = 612

63. Ans: (c)

Sol: Let their present ages be 6x and 7x respectively. Then, their age difference = 'x' years i.e. 4 = 'x' years ∴ Their present ages are 24 & 28 respectively Ratio of ages after 4years = 24 + 4 : 28 + 4 = 7 : 8

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64.	Ans: (b)		
Sol:	Expenditure in year 2016 (in 000') = 3800		
	Expenditure in year 2015 (in 000') = 3075		
	\Rightarrow Required % increase		
	$=\frac{(3800-3075)}{3075}\times100$		
	$=\frac{725}{30.75}=\frac{29}{1.23}=23.57\%$		
65.	Ans: (b)		