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

01. Ans: (d)

Sol: Here, C is a skew symmetric matrix of odd order.

Therefore, $|C| = 0$.

$\therefore$ rank of C is less than 3.

No non-zero skew symmetric matrix is of rank 1.

$\therefore$ rank of C is 2.

Hence, the system $CX = 0$ has non-zero solution.

The number of linearly independent solutions of the system $CX = 0$ is $(n - r)$

Here, $n = 3$ and $r = 2$

$\therefore$ Option (D) is not true

02. Ans: (c)

Sol: We have algorithm to decide equivalence of FA.

03. Ans: (b)

Sol: LALR(1) requires less space for its parsing table

04. Ans: 4

Sol: To store the keys in dense index, the number of blocks needed $= \frac{48}{12} = 4$

05. Ans:2

Sol: FTP connection require two TCP connections, one for data and one for control.

06. Ans: 2

Sol: In Q_3, all the cycles are of even length.

$\Rightarrow Q_3$ is a bipartite graph

$\Rightarrow Q_3$ is 2-colorable

$\therefore$ The chromatic number of Q_3 is 2

07. Ans: (b)

Sol: Firewire refers to an interface designed for connecting peripheral devices such as hard drives, DVD drives and digital video cameras to a computer system.

08. Ans: (c)

Sol: $L = \{w \in (a+b+c)^* \mid n_a(w) \neq n_b(w) \neq n_c(w)\}$

$= \{w \in (a+b+c)^* \mid n_a(w) \neq n_b(w) \& n_b(w) \neq n_c(w)\}$

$L = \{w \in (a+b+c)^* \mid n_a(w) = n_b(w) \text{ or } n_b(w) = n_c(w)\}$

$\therefore$ L is CFL. Here L is a CSL.

09. Ans: (b)

Sol: After first iteration of quicksort, we have (n–1) elements which are not yet sorted.

$T(n) = T(n-1) + T(1) + cn$

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10. Ans: (d)

Sol: Trail (S) > b $\Rightarrow$ {b,c} > b

11. Ans: (b)

Sol: For poisson distribution,

mean = λ = np = 10(0.1) = 1

Required probability = $P(X \le 1)$

$= P(X = 0) + P(X = 1)$

$= \frac{\lambda^0 e^{-\lambda}}{0!} + \frac{\lambda^1 e^{-\lambda}}{1!}$

$= e^{-\lambda} + \lambda e^{-\lambda}$

where $\lambda = 1$

$= 2e^{-1}$

12. Ans: 40

Sol: ## is concatenation C pre-processor operator. It only concatenates the operands i.e. a##b=ab

If we see an intermediate file then we find that code has converted into following intermediate code before the start of actual compilation.

Intermediate file:

test. C 1:

test. C 2: void main() {

test. C 3: int x = 5, y = 10, xy = 20;

test. C 4: printf ("%d", xy+xy);

test. C 5: }

test. C 6:

It is clear call(x, y) has replaced by xy.

13. Ans: (c)

14. Ans: (c)

Sol: The recurrence relation for binary search is

T(n) = T(n/2) + C

So, the time complexity is O(log n). Here we are using recursion, So, inbuilt recursion uses stack. So log n activation records are inserted into the stack.

15. Ans: (a)

Sol: (a) is CSL , (b) is DCFL, (c) is DCFL, (d) is Regular language

(b) , (c) and (d) languages are CFL

since every regular language is CFL

every DCFL is CFL

16. Ans: (d)

Sol: The schedule is strict and every strict schedule is both recoverable and cascadeless.

17. Ans: 8

Sol: Let |B| = n

Number of 1-1 functions from A to B

= P(n, 5) = 6720

$\Rightarrow$ n(n – 1) (n – 2) (n – 3) (n – 4)

= 8.7.6.5.4

$\Rightarrow$ n = 8

18. Ans: (c)

Sol: Micro-programming is a technique, which is used to write the binary format of control signals in the control memory of the system

19. Ans: (d)

Sol: $F = A.B.\left(\overline{A.\overline{C}}\right)$

$= A.B.\left(\overline{A} + C\right)$

$F = A.B.C \Rightarrow F = \overline{\overline{A.B.C}}$

Thus 'F' requires ④ 2 input NAND gates

20. Ans: (b)

Sol: In stack memory, arithmetic expressions are represented in post-fix notation which is also known as Reverse Polish Notation.

21. Ans: (a)

Sol: Non-repudiation protocol = digital signature

22. Ans: (a)

Sol: Some instructions are privileged instructions and should be executed by OS only. To provide protection of such instruction execution dual mode of operation is used.

23. Ans: (a)

Sol: $\sim [\forall x\ \forall y\{(x < y) \rightarrow \exists z(x < z < y)\}]$

$\Leftrightarrow [\exists x\ \exists y \sim\{(x < y) \rightarrow \exists z(x < z < y)\}]$

$\Leftrightarrow [\exists x\ \exists y\ \{(x < y) \wedge \sim\exists z(x < z < y)\}]$

$\Leftrightarrow \exists x\ \exists y\{(x < y) \wedge \forall z[(x \geq z) \vee (z \geq y)]\}$

24. Ans: (c)

Sol: When the second time reverse(28); is called from "main( )" then variable 'S' will not be reinitialized to zero and value of 'S' i.e 1 5 2 of the previous call remains in it and adds to it.

25. Ans: 3.84 to 3.85

Sol: t_n/ program $= 5 \times n$ clocks

(where $T_{stage} = 1$ clock)

t_p/program = [(0.9 × 1) × 1 clock] +

[(0.1 × (1 + 3) × 1 clock)]

= 0.9 clock + 0.4 clock

= 1.3 clock × n

$$\text{Speedup} = \frac{5 \times \text{n clock}}{1.3 \times \text{n clock}} = 3.846$$

26. Ans: (d)

Sol: Sender's maximum sending window size

1. In Go Back-N (number of distinct sequences–1)
2. In selective Repeat ARQ

$$\Rightarrow \left(\frac{\text{number of distinct sequences}}{2}\right)$$

27. Ans: (d)

Sol: Both L_1 and L_2 are DCFL and they are closed under complementation

So $\overline{L}_1$ and $\overline{L}_2$ are also DCFL

$L = L_1 - L_2$

$L = L_1 \cap \overline{L}_2$

DCFL is not closed under intersection

L is not DCFL

L is recursive language

$\overline{L}$ is also recursive language,

since recursive language closed under complementation.

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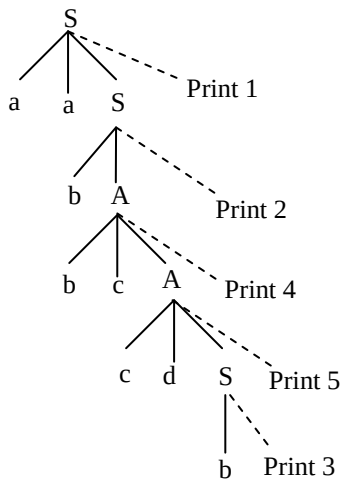
28. Ans: (d)

Sol:



The Depth first traversal of the parse tree prints 3 5 4 2 1.

29. Ans: 7

Sol: Probability of getting success in x rolls =

$$P(X = x) = \left(\frac{5}{6}\right)^{x-2}\left(\frac{1}{6}\right) \qquad x = 2, 3, 4, ...$$

$$E(X) = \sum_{x=2}^{\infty} x\left(\frac{5}{6}\right)^{x-2}\frac{1}{6}$$

$$= \frac{1}{6}\left[2 + 3\left(\frac{5}{6}\right) + 4\left(\frac{5}{6}\right)^2 + ...\right]$$

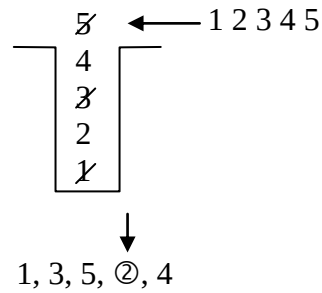
$$= \frac{1}{6}.\frac{6}{5}\left\{2\left(\frac{5}{6}\right) + 3\left(\frac{5}{6}\right)^2 + 4\left(\frac{5}{6}\right)^3 + ...\right\}$$

$$= \frac{1}{5}\left[\left\{1 + 2\left(\frac{5}{6}\right) + 3\left(\frac{5}{6}\right)^2 + ...\right\} - 1\right]$$

$$= \frac{1}{5}\left[\left(1 + \frac{5}{6}\right)^{-2} - 1\right] = 7$$

30. Ans: (d)

Sol:



② cannot be popped ahead of ④.

31. Ans: 2

Sol: CD+ ,D+ , ABH+ and DH+ contains all the attributes of the relation and are super keys. In which D and AH are minimal sets that are candidate keys.

32. Ans: 8

Sol: If all 4 processes acquire 2 tape units each, then too deadlock will arise.
So, maximum number = 8

33. Ans: (b)

Sol: In C,
array[2] = *(array+2) = *(2+array)
= –2 [array] = –30

34. Ans: (c)

Sol: A simple graph G with n vertices is connected if $\delta(G) \geq \left(\frac{n-1}{2}\right)$.

In the present example, $\delta(G) = 6$ and $n = 11$
$\therefore$ G is connected.

In a connected graph, Euler circuit exists if all the vertices are of even degree. (Theorem)

$\therefore$ Euler circuit exists in G.

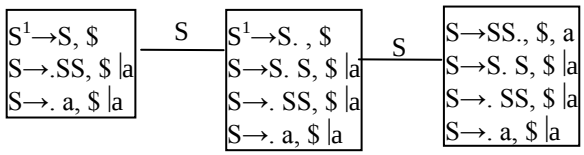
In a simple graph, if deg(v) $\geq \frac{n}{2}$ for all $v \in G$, then Hamiltonian cycle exists in G. (Theorem)

In the present example, n = 11 and deg(v) = 6 for all $v \in G$.

$\therefore$ Hamiltonian cycle exist in G.

35. Ans: (d)

Sol: The grammar is ambiguous and ambiguous grammar is neither LL(1) nor LR(k)



36. Ans: (c)

Sol: Between <E, C>, <E, D> we can choose only 1 edge in $^2C_1 = 2$ ways.

Similarly <H, F>, <F, G>, we can choose only 1 edge in $^2C_1 = 2$ ways.

Total number of possible spanning tree

$= {}^2C_1 * {}^2C_1 = 4$.

37. Ans: 660

Sol: Number of cylinder movements

= (20–10) + (22– 10) + (22 – 20) + (40–20) + (40 – 6) + (38 – 6) = 110

Time taken for 110 movements

= 110 × 6 msec = 660 msec

38. Ans: (c)

Sol: Number of hosts= n, then number of keys

For Private (Secret or Common) Key Cryptography

$= {}^nC_2 = \frac{n(n-1)}{2} = \frac{10(10-1)}{2} = 45$

For Public Key Cryptography

= 2 × n = 2 × 10 = 20

39. Ans: (b)

Sol: $a^R b$ iff [a] = [b]

(a) –7 is not related to 12, because their difference is not divisible by 4.

$\therefore [-7] \neq [12]$

(b) –7 is related to 13, because –7 –13=–20 is divisible by 4.

$\therefore [-7] = [13]$

(c) –7 is not related to 14, because their difference is not divisible by 4.

$\therefore [-7] \neq [14]$

(d) –7 is not related to 15, because their difference is not divisible by 4.

$\therefore [-7] \neq [15]$

40. Ans: (a)

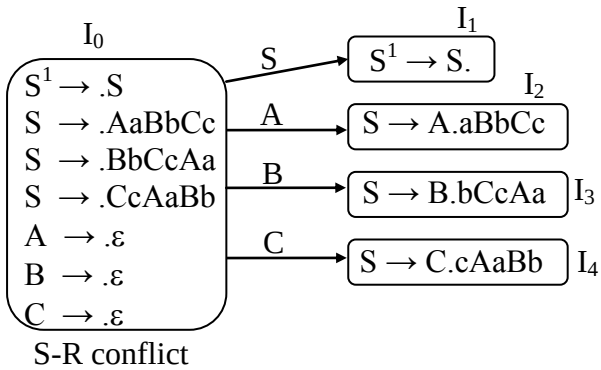
Sol: LL(1) for given grammar is

First(S) = {a, b, c}	Follow(S) = {$}
First(A) = {ε}	Follow(A) = {a}
First(B) = {ε}	Follow(B) = {b}
First(C) = {ε}	Follow(C) = {c}

	a	b	c	$
S	S→AaBbCc	S→BbCcAa	S→CcAaBb	
A	A → ε			
B		B → ε		
C			C → ε	

∴ The given grammar is LL(1).

LR(0) items for given grammar is



S-R conflict

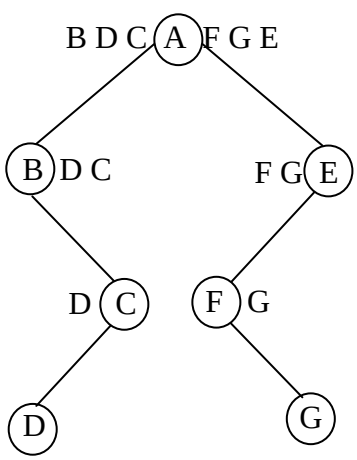
∴ The given grammar is not LR(0).

41. Ans: (a)

Sol: Preorder : A B C D E F G

In-order : B D C A F G E

Post-order: D C B G F E A



42. Ans: (d)

Sol: A steady stream of high priority processes can block a lower priority process indefinitely

43. Ans: 1.6

Sol: Given ⇒ M = max burst = 60 Mbps

ρ = constant rate

= token arrival rate = 10 Mbps

C = 80 Mb

S = ?

$$S = \frac{C}{M-\rho} = \frac{80\,\text{Mbits}}{(60-10)\text{Mbits/sec}}$$

$$= \frac{80}{50}\text{sec}$$

= 1.6 sec

44. Ans: (b)

Sol: SR FF characteristic equation is

$$Q(t+1) = S + \overline{R}.Q(t) \quad \text{..... (1)}$$

Substitute S, R values into equation (1) to get XY FF characteristic equation

$$Q(t+1) = X.Q(t) + \overline{Y.\overline{Q(t)}}.Q(t)$$

$$= X.Q(t) + [\overline{Y} + Q(t)].\,Q(t)$$

$$= X.Q(t) + \overline{Y}.Q(t) + Q(t)$$

$$= [X + \overline{Y} + 1].Q(t)$$

Q(t+1) = Q(t) .....(2)

Equation (2) is characteristic equation of XY FF

Option (a): $Q(t+1) = X.\overline{Q(t)} + \overline{Y}.Q(t)$

If they consider these equations as conversions from SR FF to JK FF.

Option (c): $Q(t+1) = [J + Q(t)][\overline{K} + \overline{Q(t)}]$

If they consider these are conversions from SR FF to JK FF and characteristic equation is in POS form.

45. Ans: (a)

Sol: **S1:** $\forall x\ \exists y\ \exists z\ (x = 7y + 5z)$

If we choose, $y = -2x$ and $z = 3x$ then

$x = 7y + 5z$ becomes $x = 7(-2x) + 5(3x) = x$

$\therefore$ S1 is true.

S2: $\forall x\ \exists y\ \exists z\ (x = 4y + 6z)$

For any two integers y and z,

$4y + 6z = 2(y + 3z)$ is even.

For example, when $x = 1$, then there are no integers y and z such that $x = 4y + 6z$

$\therefore$ S2 is false.

46. Ans: (c)

Sol: A schedule is said to be strict if a value written by a transaction T is to be read or written by another transaction until either T commits or aborts.

47. Ans: (c)

Sol: The lengths of 10 files are

4, 2, 1, 5, 10, 15, 20, 10, 3, 5

Select smallest length files

Z_1 = merge f_2 and f_3 $\Rightarrow$ $Z_1 = 2 + 1 = 3$

Z_2 = merge Z_1 and f_4 $\Rightarrow$ $Z_2 = 3 + 3 = 6$

Z_3 = merge f_1 and f_4 $\Rightarrow$ $Z_3 = 4 + 5 = 9$

Z_4 = merge f_{10} and Z_2 $\Rightarrow$ $Z_4 = 5 + 6 = 11$

Z_5 = merge Z_3 and f_5 $\Rightarrow$ $Z_5 = 9 + 10 = 19$

Z_6 = merge f_8 and Z_4 $\Rightarrow$ $Z_6 = 10 + 11 = 21$

Z_7 = merge f_6 and Z_5 $\Rightarrow$ $Z_7 = 15 + 19 = 34$

Z_8 = merge f_7 and Z_5 $\Rightarrow$ $Z_8 = 20 + 21 = 41$

Z_9 = merge Z_7 and Z_8 $\Rightarrow$ $Z_9 = 34 + 41 = 75$

minimum cost of merging ten files

$= Z_1+Z_2+Z_3+ Z_4+Z_5+Z_6+Z_7+Z_8+Z_9 = 219$

48. Ans: 3.2

Sol: TCP uses SWP

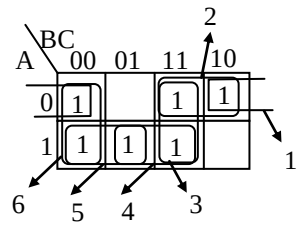
$$\text{Through put} = \frac{1\text{window}}{\text{RTT}} = \frac{512 \times 8}{2 \times 32\text{m sec}}$$

$= 64$ kbps

$$\eta = \frac{\text{Th}}{\text{Bw}} = \frac{64 \times 10^3}{2 \times 10^6} = 32 \times 10^{-3} = 0.032 = 3.2\%$$

49. Ans: (a)

Sol:



There are 6 PI's.

But EPI's are Nil.

50. Ans: (b)

Sol: Let $F(a) = \int_0^\infty \frac{e^{-x}\sin(ax)}{x}dx$

Differentiating partially with respect to a

$$F'(a) = \int_0^\infty \frac{e^{-x}}{x} x\cos(ax)dx$$

$$= \frac{a}{a^2+1}$$

$\Rightarrow F(a) = \tan^{-1}a + c$

$F(0) = 0 \Rightarrow c = 0$

$\therefore F(a) = \tan^{-1}a$

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51. Ans: 157

Sol: Number of calls = value returned by fun(i)

i	1	2	3	4	5	6	7	8	9	10
fun(i)	1	1	1	4	7	13	25	46	85	157

52. Ans: (c)

Sol: Requirement: choose n such that both n, $\frac{n-1}{2}$ should be prime

(a) 33 not prime

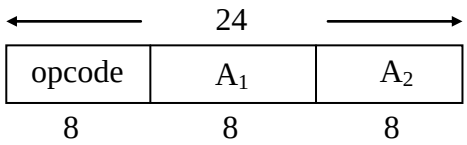
(b) 27 not prime

(c) 47 prime $\frac{47-1}{2}=\frac{46}{2}=23$ prime

(d) 19, but $\frac{19-1}{2}=\frac{18}{2}=9$ not prime

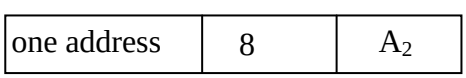
53. Ans: 512

Sol: Maximum number of two address instructions = 256



but it uses 255 instructions and one combination is free.

With one free combination, maximum number of one address instructions to be generated $= 2^8 = 256$



but it uses 254 out of 256 instructions and remaining two combinations are used for zero address instructions.

Hence maximum number of zero address instructions to be formulated =2×256= 512

54. Ans: (d)

Sol: Keyword break is not part of if-else statement. Hence it will show compiler error: Misplaced break.

55. Ans: 0.5

Sol:

Clk	$D_1=\overline{Q_1}Q_0$	$D_0=\overline{Q_0}$	Q_1Q_0
0	0	1	0 0
1	0	1	0 1
2	1	0	1 0
3	0	1	0 1
4	1	0	1 0

The given circuit has 2-states. $\Rightarrow$ means MOD-2 counter

$\therefore$ The output frequency is given by

$$f_{out}=\frac{f_{clk}}{2}=\frac{1MHz}{2}=0.5MHz$$

56. Ans: (b)

Sol: (so) is wrong because they mean the same.

57. Ans: (c)

58. Ans: (a)

59. Ans: (d)

Sol: Capacity of the tank

= (12×13.5) =162 litres

Capacity of each bucket = 9 litres.

Number of buckets needed = 162/9 =18

60. Ans: (d)

Sol: Volume of Cuboid=length×breadth× height

Number of cuboids

$$= \frac{(Volume\ of\ cuboids)\ formed\ \ from}{(Volume\ of\ \ cuboids)\ taken}$$

$$= \frac{18\times15\times12}{5\times3\times2} = 108$$

61. Ans: (b)

Sol: **At the most case:** Let the numbers be {–45, 1, 1, 1, ……, 1}.

Average is 0. So, at the most 44 numbers may be > 0.

At the least case: Let the numbers be {45, –1, –1, –1, …., –1}.

Average is 0. So, at the least 1 number may be > 0.

62. Ans: (b)

Sol: Perimeter = Distance covered in 8 min.

$$= 12000 \times \frac{8}{60}\text{ m} = 1600\text{ m}.$$

Let length = $3x$ metres

and breadth = $2x$ metres.

Then, $2(3x + 2x) = 1600$ or $x = 160$.

$\therefore$ Length = 480 m and Breadth = 320 m

$\therefore$ Area = (480 x 320) m^2 = 153600 m^2

63. Ans: (b)

Sol: Consider CP as 100%.

Loss 15% $\Rightarrow$ So, SP = 85%

Gain 15 % $\Rightarrow$ So, New SP = 115%

Given 115% – 85% = 30% = 450

$$\frac{100}{30}\times450 = 1500$$

64. Ans: (a)

Sol: GDP at the beginning of 2013 is equal to the GDP at the end of 2012

$\Rightarrow$ GDP growth rate in 2012 = 7%

GDP at the end of 2011 = GDP at the beginning of 2012 = \$1 trillion

$\therefore$ GDP at the beginning of 2013

$$= \frac{100+7}{100}\times1\ trillion$$

$$= \frac{107}{100} = \$1.07\ trillion$$

65. Ans: (a)

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