CS GATE 2010 Answer Keys

1	C	**2**	D	**3**	C	**4**	A	**5**	B	**6**	A	**7**	D
8	A	**9**	B	**10**	A	**11**	D	**12**	C	**13**	B	**14**	C
15	D	**16**	D	**17**	B	**18**	C	**19**	C	**20**	B	**21**	A
22	B	**23**	A	**24**	A	**25**	D	**26**	A	**27**	A	**28**	D
29	D	**30**	D	**31**	A	**32**	A	**33**	B	**34**	A	**35**	C
36	D	**37**		**38**	C	**39**	B	**40**	D	**41**	C	**42**	A
43	A	**44**	D	**45**	A	**46**	B	**47**	D	**48**	C	**49**	A
50	D	**51**	B	**52**	C	**53**		**54**	D	**55**	A	**56**	C
57	B	**58**	D	**59**	D	**60**	A	**60**	C	**61**	C	**62**	B
63	C	**64**	D	**65**	B								

Explanations:-

2. $x_{n+1} = x_0 - \dfrac{f(x_0)}{f'(x_0)}$

$n = 0$

$x_1 = x_0 - \dfrac{f(x_0)}{f^1(x_0)}$

given $x_0 = 3.5, \quad f(x) = x^2 - 13$

$f(3.5) = (3.5)^2 - 13 = -0.75$

$f'(x) = 2x$

$f'(3.5) = 2 \times 3.5 = 7$

So after one iteration

$$x_1 = x_0 - \frac{f(x_0)}{f_1(x_0)} = 3.5 - \frac{(-0.75)}{7} = 3.607$$

3. Total number of reflexive relations are = $2^{n^2-n}=2^{25-5}=2^{20}$

4. A group satisfies four properties

1. Closure 2.Associative 3.Identity 4.Inverse

So let $S = \{(1, \omega, \omega^2), *\}$

1. Closure

$1 * \omega = \omega \in s$

$\omega * \omega^2 = 1 \in s$

$\omega^2 * 1 = \omega^2 \in s$

closed under set s

2. Associative

$a*(b*c)=(a*b)*c$

$1*(\omega*\omega^2)$ $\qquad$ $(1*\omega)*\omega^2$

$=1*\omega^3$ $\qquad$ $=\omega*\omega^2$

$=\omega^3$ $\qquad$ $=\omega^3$

i.e., associative property hold

3. Identity

$a*e=a\in G,\ \exists e\in G$

$1*\omega=\omega\in G$

$1*\omega^2=\omega^2\in G$ } Identity hold

$1*1=1\in G$

4. Inverse

$x*a=e,\ x,a,e\in G$

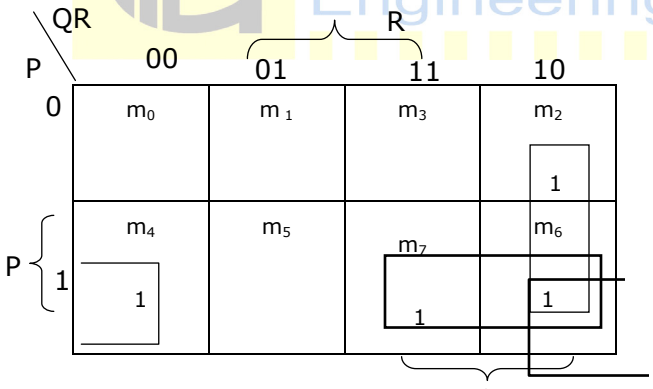
$1*1=1$

$\omega*\omega^2=1$ hold so given set is a Group

$\omega^2*\omega=1$

5. $\lim_{n\to\infty}\left(1-\frac{1}{n}\right)^{2n}=\left(\lim_{n\to\infty}\left(1-\frac{1}{n}\right)^{-n}\right)^{-2}=e^{-2}$

6.



Minterms are 1 at ($m_2 + m_4 + m_6 + m_7$)

(m_2 m_6) Map is for $Q\bar{R}$

(m_7m_6) Map is for PQ

(m_4m_6) Map is for $P\bar{R}$

8. $P = (F87B)_{16}$ is – 1111 1000 0111 1011 = - 1925

P * 8 = 1925 x 8 = -15400.

2's complement is 11000011 1101 1000

It is equivalent to $(C3D8)_{16}$

9.

P	Q	F
0	0	R
0	1	$\overline{R}$
1	0	$\overline{R}$
1	1	R

So is

$P^1Q^1R + P^1QR^1 + PQ^1R^1 + PQR$

$P^1(Q^1R + QR^1) + P(Q^1R^1 + QR)$

$P^1 (Q \oplus R) + P (Q \odot R)$

$= P \oplus Q \oplus R.$

15. Whenever Time to live field reaches '0' we discard the packet, so that we can prevent it from looping

17. Union of two recursive enumerable is not R.E and also the Intersection, L_2-L_1 is r.E is True but $L_1 - L_3$ need not to be recursive enumerable

23. Both the processes cannot be there simultaneously in critical section, so it will satisfy mutual exclusion,

24. Since we have 4 page frames, 1 to 100 pages will get 100 faults, But in reverse, there wont be any fault for page No's 100, 99, 98, 97, and for remaining 96 faults, Total = 100 + 96 = 196.

25. Any preemptive scheduling strategy may cause starvation, SRTF is also preemptive SJF. In FCFS late arriving short Job have to wait for long time, but in RR, the time QUANTUM expiry will preempt the present job and give the response to the next job in Queue so All are TRUE

26. Given, the probability of faulty assembly of the computers=p

$\therefore$ The probability of non faulty assembly of the computers=1-p

The probability of correct result for any computer in testing process=q

$\therefore$ The probability of correct result for any computer in testing process=1-q

The probability of a computer being declared faulty=

probability of being faulty **and** probability of being declared **or**

probability of not being faulty **and** probability of declaring incorrectly.

=pq+(1-p)(1-q)

27. The divisors of 10^{96} which are multiples of 10^{99} are

10^{96},$2x10^{96}$,$4x10^{96}$,$5x10^{96}$,$8x10^{96}$,$10x10^{96}$,$20x10^{96}$,$25x10^{96}$,$40x10^{96}$,$50x10^{96}$,

$100x10^{96}$, 125x1096, 200x1096, 250x1096, 500x1096, $1000x10^{96}$

That is a total of 16

The total number of divisors of $10^{99} = 2^{99}x5^{99} = (99+1)(99+1) = 10000$

The required probability=16/10000=1/625

29. $A = \begin{bmatrix} 2 & 3 \\ x & 4 \end{bmatrix}$

$[A - \lambda I] = 0$

$\begin{bmatrix} 2-\lambda & 3 \\ x & y-\lambda \end{bmatrix} = 0$

$(2-\lambda)(y-\lambda) - 3x = 0$

given eigen values : $\lambda = 4, 8$

if we use $\lambda = 4$ then eqution, $-2(y-4) - 3x = 0 - - - - -$ (i)

if we use $\lambda = 8$ then eqution, $-6(y-8) - 3x = 0 - - - - -$ (ii)

Solving eqations (i) & (ii), we get, $x = -4, y = 10$

31 $\overline{\left((\overline{P+Q}) + (\overline{Q+R})\right)} + \overline{\left((\overline{P+R}) + (\overline{Q+R})\right)}$

So it can be written as

$\left((\overline{P+Q}) + (\overline{Q+R})\right).\left((\overline{P+R}) + (\overline{Q+R})\right)$

$\left[\because (A+B)^1 = A^1B^1\right]$

$(P^1Q^1 + Q^1R^1)\ .\ (P^1R^1 + Q^1R^1)$

$P^1Q^1\ P^1R^1 + P^1Q^1Q^1R^1 + Q^1R^1P^1R^1 + Q^1R^1Q^1R^1$

$P^1Q^1R^1 + P^1Q^1R^1 + Q^1P^1R^1 + Q^1R^1$ [$\because$ X X = X]

$P^1Q^1R^1 + Q^1P^1R^1 + Q^1R^1$ [X+X = X]

$P^1Q^1R^1 + Q^1R^1$

$Q^1R^1[P^1 + 1] \Rightarrow Q^1R^1 \Rightarrow (\overline{Q+R})$

32. Initially $\begin{matrix} Q_1 & Q_0 \\ 0 & 0 \end{matrix}$

Here T is T – flip flop

If T = 0 the next state is equal to present state

When T = 1 the next state is compliment of present state.

For both flip flops the T input is '1' (constant) the O|P 'Q_0' is given as a clock to the next T – flip flop.

Initially Both **will** be complimented It will become 11,

Next second Q_1 remains 1 since the Q_0 became '0' when T i/p is 1, so when clock is not present it remains in same state,…

So it will go for sequence 11, 10, 01, 00

33. clocks.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
I_0	IF	ID	OF	PO	PO	PO	WO									
I_1		IF	ID	OF	Stall	Stall	PO	PO	PO	PO	PO	PO	WO			
I_2			IF	ID	OF	-	-	-	-	-	-	-	PO	WO		
I_3				IF	ID	OF	-	-	-	-	-	-	-	PO	WO	

So total 15 cycles required

35.

12	7	13	4	11	6

A= 100 102 104 106 108 110

$f(a,6) \to 12 + f(a+1, n+1)$

$\downarrow$

$7 - f(a+1, n-1) \to 13 - f(a+1, n-1)$

$\downarrow$

$4 + f(a+1), n+1)$

$\downarrow$

$11 - f(a+1, n-1)$

$\downarrow$

$6 + f(a+1, 0)$

$\downarrow$

0

$(12 + (7 - (13 - (4 + (11 - (6 + 0))))))$

$= 15$

38. Grammar $s = asa \mid bs \mid C$

$First(s) = \{a, b, c\}$

$Follow(s) = \{a, \$\}$

LL(1)

	a	b	c	$
s	$s \to asa$	$s \to bs$	$s \to c$	

No multiple entries see this is LL(1) Grammar.

$LR(1)$: $S \to asa \mid bs \mid C$

1. $S \to asa$
2. $S \to bs$
3. $S \to c$

I_0 : $s' \to .s, \$$

$s' \to .asa, \$$

$s \to .bs, \$$

$s \to .c, \&$

I_1 : $s' \to s., \$$

I_2 : $s \to a.sa, \$$

$s \to .asa, a$

$s \to .bs, a$

$s \to .c, a$

I_9 : $s \to bs., \$$

I_{10} : $s \to b.s, \$$

: $s \to .asa, \$$

: $s \to .bs, \$$

: $s \to .c, \$$

I_{11} : $s \to asa., \$$

$I_3 : s \to b.s, \$$
$s \to .asa, \$$
$s \to .bs, \$$
$s \to .c, \$$
$I_4 : s \to c., \$$
$I_5 : s \to as.a, \$$
$I_6 : s \to a.sa, a$
$s \to .asa, a$
$s \to .bs, a$
$s \to .c, a$
$I_7 : s \to b.s, a$
$s \to .asa, a$
$s \to .bs, a$
$s \to .c, a$
$I_8 : s \to c., a$
$I_{12} : s \to as.a, a$
$I_{13} : s \to bs., a$
$I_{14} : s \to bs., \$$
$I_{15} : s \to asa., a$

	a	b	c	$	s
0	S_2	S_3	S_4		1
1					
2	S_6	S_7	S_8		5
3	S_2	S_{10}	S_4		9
4				r_3	
5	S_{11}				
6	S_6	S_7	S_8		12
7	S_6	S_7	S_8		13
8	R_3				
9				r_2	
10	S_2	S_3	S_4		14
11				r_1	
12	S_{15}				
13	r_2				
14				r_2	
15	r_1				

No multiple entries so thus LR(1) also.

39. Every string should contain even number of '1' s. min string are ε, 0, 11, 101, 1010…….. we get those string from the expression 0* (10* 10*)*

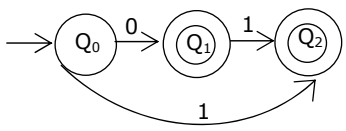
In option C and D Min. string is not ε. In option A we don't get, 0,00,000….

40. All the given languages can be recognized by the push-Down Automation

41. Ex: Let w = 01

substring are 0, 1, 01

NFA is



If requires Min 3,

So, If string length is 'n' It required n + 1 states.

45. Initially neither P_1 nor P_2 can go, only P_0 can go since It uses the semaphore so whose value is '1'

It prints '0' then, after releasing s_1, s_2, again either P_1 or P_2 releases 'S_0 so that it will go to print '0' at least twice

47. Net mask is meant for giving the network address of a given IP Address. When Both IP-Addresses are in the same Network, After performing the Mask operation, same Id must be there for both, It will not come when we use 255. 255.255.224

10. 105. 1. 113	10. 105. 1. 91
255. 255. 255. 224	255. 255. 255. 224
10. 105. 1. 106.	10. 105. 1. 64

Both are different, for all the others it will show the same Id.

Above Mask operation will be done in binary octants

48. A block to access in L_2 cache requires 20 nanoseconds, and 2 sec to place in L_1 – cache, so is total 22 nanoseconds

49. When there is a miss in both L_1, L_2, It has to access in Main which takes 200 nanoseans, and 20 nanoseconds to transfer to L_2 cache and 2 for L_1 cache,

Total = 200 + 20 + 2 = 222

52. 46, 34, 42, 23, 52, 33

hash function $h(k) = k \bmod 10$

sol, 46, $h(46) = 46 \bmod 10 = 6.(\text{index})$

so, 46 will be stored on index 6

Similarly, 34

$h(34) = 34 \bmod 10 = 4$

$42 \to 2$

$23 \to 3$

$52 \to 2$ (location is occupied)

so it will be stored next at next rempty location

$33 \to 3$ (location is occupied)

so it will be stored next at next rempty location

54. In Distance vector, the Router will update its routing tables by exchanging the information from all its neighbors.

After All the routing tables stabilize the routing Table for 'R_1' will not have any entry to Router R_6., so that link will not be used.

So one link.

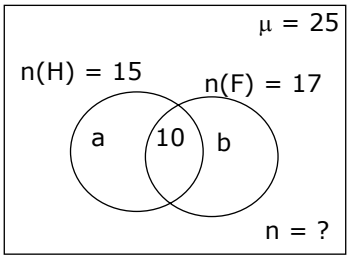
55. There will be no link unused since the link from R_1 to R_6 is also filled with weight 2.

56. The key words in the statement are 'casual remarks' and 'lack of seriousness'. The blank should be filled with a word meaning 'showed' or 'revealed'. Hence, 'betrayed' is the correct answer.

57. Circuitous means round about or not direct. Therefore the closest in meaning will be indirect

58. The clue in this sentence is 'If we manage to _____our natural resources' and 'better planet'. This implies that the blank should be filled by a word which means 'preserve' or 'keep for long time'. Therefore the word 'conserve' is the right answer.

59. Representing the given information in the Venn diagram, we have



Let, the number of people who play only hockey = a

The number of people who play only football = b

Now, a = n(H) – 10 = 15 – 10 = 5

b = n(F) – 10 = 17– 10 = 7

Clearly, a + b + 10 + n = 25

$\Rightarrow$ n = 25 – 7 - 5 -10 $\Rightarrow$ n = 3

$\therefore$ The number of people who play neither Hockey nor Football is 3

60. A worker who is inactive or not working is termed as unemployed, similarly land which is inactive or not in use is called Fallow.

61. Given,

137 + 276 = 435

Adding units digits i.e. 7 + 6 = 13, but given as 5, which is 13 – 8 and also 1 is carry forwarded to the tens place.

```
i.e.,        +1
             7    6
             3    7
             ----------
                  05
```

Here, 7 + 3 + 1 = 11 i.e., 11 – 8 = 3 and 1 is carry forwarded to hundreds place

```
             +1   +1
             1    7    6
             2    3    7
             ------------------------
                  3    5
```

Now, the sum of digits in hundred's place is 1 + 1 + 2 = 4

i.e.,

```
1       7       6
2       3       7
------------------------
4       3       5
-------------------------
```

Using the same logic, we have

```
        +1
+1      7       3       1
        6       7       2
---------------------------------
1       6       2       3
---------------------------------
```

Sum of units digits 1+2 = 3, sum of tens digit = 3 + 7 = 10 i.e. 10 -2 and + 1 carry forward and Sum of hundreds digits= 1 + 7 + 6 = 14 i.e., 14 – 8 = 6 and one carry forward.

62.

i) H + G > I + S

ii) |G - S| = 1

Meaning G & S will be next to each other in the order. So the option A is ruled out.

G not oldest

S not youngest

iii) No twins.

Going by the options, we will try to solve the equation,

Taking an example with youngest aged 1, we can try to solve the equation,

and correct the age (started with ages 4,3,2,1) to suit condition (i) and (ii) which gives 5,4,3,1

S	4	**5**	I +4	Generalizing, we can take their ages in terms of I's age,
G	3	**4**	I + 3	In this case, H + G > I + S
H	2	**3**	I + 2	Since 2I + 5 > 2I + 4
I	1	**1**	I	

I	4	In this order, G is always less than I and H is always less than S.
G	3	So G<I and H<S
S	2	Implies G+H < I + S, all values are positive
H	1	Defies condition i) Hence incorrect.

I	4	In this order H< I, G<S
H	3	Hence H +G < I + S
S	2	Defies Condition i)
G	1	Hence incorrect.

63. Among the answer choices, the three options B, C and D can be inferred from the passage. But the main essence of the passage is that chemical agents are being used my military establishments in warfare which is not desirable. Therefore option C is the statement which best sums up the meaning of the passage.

64. Given,
5 skilled workers can build a wall in 20 days i.e., 1 skilled worker can build the same wall in 100 days

$\therefore$ The capacity of each skilled worker is $\frac{1}{100}$

8 semi-skilled workers can build a wall in 25 days
i.e., 1 semi-skilled worker can build the same wall in 200 days

$\therefore$ the capacity of each semi-skilled worker is $\frac{1}{200}$

Similarly, the capacity of 1 unskilled worker is $\frac{1}{300}$.

Now, the capacity of 2 skilled+6 semi-skilled+5 unskilled workers is $2\left(\frac{1}{100}\right) + 6\left(\frac{1}{200}\right) + \frac{5}{300}$

$= \frac{2}{100} + \frac{3}{100} + \frac{5}{100} = \frac{20}{300} = \frac{1}{15}$

$\therefore$ The required numbers of days is 15

65. The given digits are 2,2,3,3,3,4,4,4,4 we have to find the numbers that are greater than 3000
$\therefore$ The first digit can be 3 or 4 but not 2.
Now, let us fix the first, second and third digits as 3, 2, 2 and then the fourth place can be filled in 3 ways.
i.e.,

3	2	2	2 or 3 or 4	3 ways

$\therefore$ the number of ways is 3.
Similarly, we fix first, third and fourth places as 3, 2 and 2 respectively, so the second place can be filled in 3 ways again

i.e.,

3	2 or 3 or 4	2	2

The number of ways is 3.
Now, we fix first, second and fourth places just as previous cases and we obtain the same result.
$\therefore$ The number of ways is 3 so; the total number of ways is 9.
Similarly this can do by fixing the numbers as 3 and 4 (instead of 2) and thereby we obtain the 9 ways in each case.
$\therefore$ The number of numbers greater than 3000 starting with 3 is 27
Similarly by taking 4 as the first digit and applying the same process, we get 27 numbers
$\therefore$ The total number of numbers that are greater than 3000 is 27 + 27 = 54
But, 3222 and 4222 is not possible as there are only two 2's (given), 3333 is also not possible as there are only three 3's (given)
$\therefore$ The total number of numbers that are greater than 3000 is 54 – 3 = 51.