EE GATE 2010 Answer Keys

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

Explanations:-

1. $\int_0^1 e^x dx = x \int_0^1 e^x dx - \int_0^1 (1) \int_0^1 e^x dx$

   $\left(xe^x\right)_0^1 - \left(e^x\right)_0^1 = (e-0) - (e-1) = 1$

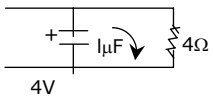
2. $\bar{\gamma} = xi + yi + zk$

   $\text{div}\,\bar{\gamma} = \text{div}(xi + yi + zk) = 3$

3. $\frac{2\pi}{T} = 0.8\pi \Rightarrow T = 2.5$ se.

4. Linear but not causal

5. At, $t = 0^+$



   $i(t) = \frac{V_o}{R}\left(1 - e^{-t/rC}\right)\Big|_{t=0} = \frac{V_o}{R} = \frac{4}{4} = 1A$

7. $\vartheta + i = 100$ and $\vartheta = i \Rightarrow i = 50$ A

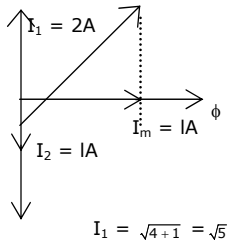
8. Wattmeter reading, $W = i_2 . V_2$ as $i_1 = i_2$

9. $N = \frac{25}{5} = 5$, $R_{sh} = \frac{0.2}{N-1} = \frac{0.2}{4} = 0.05$

10. Gain without error = 10
Gain with +10 % error = 10.1
Gain with -10 % error = 9.9
Hence it is 10plus or minus 1 %

11. Step response, $y(s) = \frac{2}{s(s+1)} \Rightarrow y(+) = 2(1 - e^t)\,u(t) \Rightarrow 2(1-e^t) = 0.98 \times 2 \Rightarrow t = 3.9$ see.

12. h1 and h2 can be compared as voltages across the capacitors and flow can be compared `as the resistances. So A and C is capacitances, B and D is resistance.

13. 

$I_1 = \sqrt{4+1} = \sqrt{5} = 2.24$

14. $V_{AB} > 0$ $V_{CD} > 0$ and $V_{AB} > V_{CD}$

15. Approximate value is given in option (A) all three options are impossible

17. $P = \frac{100 \times 100}{5} \sin 30 = 1000$; $Q = \frac{100 \times 100}{5} \cos 30 - \frac{100 \times 100}{5} = -268$

18. Symmetrical breaning current = $\frac{2000 \times 10^6}{53 \times 33 \times 10^3} = 35KA$

19. Current through the operating coil= $\frac{250 \times 5}{400} - \frac{220 \times 5}{400} = \frac{3}{8} = 0.375A$

21. $V_o = 2\left(1 + \frac{2R}{R}\right) = 6$ V

22. $V_o = \frac{10 \times 10k}{10k + 10k} = 5V$

23. Step down Chopper (Buck converter)

25. Output Voltage is proportional is $\cos\alpha$
300 proportional cos0 X proportional cos60; X = 150 V

26. $\lim_{x \to 0} \frac{\sin x}{x} = 1$ .The function is not discontinuous

$\therefore$ The function is minimum at t = 0 and it has no point of re-flexion, at t= 0 and it is also not maximum

27. Given,

The number of white balls = 4

The number of red balls = 3

The probability of drawing two balls of which first is white and the second is red is

$$\frac{4_{C_1} \times 3_{C_1}}{7_{C_2}} = \frac{4}{7}$$

28. An eigen vector of $P\begin{pmatrix}1 & 1 & 0\\ 0 & 2 & 2\\ 0 & 0 & 1\end{pmatrix}$ is $[1\ 2\ 3]^T$

29. $D^2 + 6D + 8 = 0$

$D^2 + 4D + 2D + 8 = 0$

$D(D+4) + 2(D+4) = 0$ i.e. $(D+4)(D+2)=0$

$y = C_1 e^{-4n} + C_2 e^{-2n}$

Applying initial condition the value of C_1 & C_2 can be find out and the answer is $2.e^{-2t} - e^{-4t}$

30. Since there are only two constraints and there are four variables there will be multiple non trivial solutions.

33. $\frac{12-6}{R} = 1 \Rightarrow R = 6$

37. $A = \begin{pmatrix}-1 & 2\\ 0 & 2\end{pmatrix}, \begin{pmatrix}0\\ 1\end{pmatrix} = B$; $|SI - A| = \begin{pmatrix}S+1 & -2\\ 0 & S-2\end{pmatrix}$ CE: $S^2 - S - 2 = 0$

$\therefore$ Unstable; Check for controllability: [B AB]

$$AB = \begin{pmatrix}-1 & 2\\ 0 & 2\end{pmatrix}, \begin{pmatrix}0\\ 1\end{pmatrix} = \begin{pmatrix}2\\ 2\end{pmatrix} = \begin{pmatrix}0 & 2\\ 1 & 2\end{pmatrix} \neq 0 \quad \therefore \text{ controllable}$$

42. e_1 (w.5C) = e_2 (w.5C) + e_2 (wC) $\Rightarrow$ $5e_1 = 6e_2$

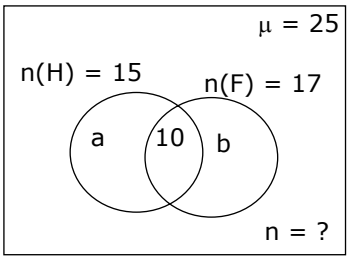
43. Capacitance per phase, $C = 3C_1 + C_2 = 1\,\mu F$

Changing current, $I_C = V.(WC) = \frac{11 \times 10^3}{\sqrt{3}} \times 314 \times 1 \times 10^{-6} = 2A$

44. Pu value for TL is $150 \times \frac{200}{(220)^2} = 0.62$

54. $100 \times \sqrt{\frac{10 \times e^{-6}}{1e^{-3}}} \sin\left(\frac{1}{\sqrt{L_C}} t\right) = 10 \sin(10^4 t)$

56. 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

57. 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.

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

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

60. 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.

61.

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.

62. 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

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. 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

$\square$ 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.

∴ 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

∴ 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)

∴ The total number of numbers that are greater than 3000 is 54 – 3 = 51.

65. 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. 6 and one carry forward.