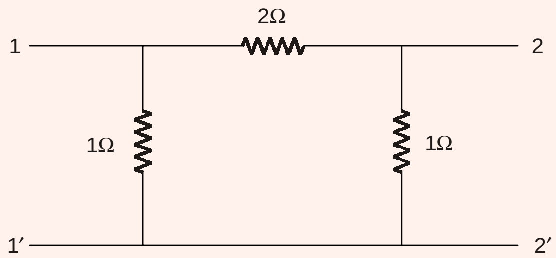
## Gate 16th Feb Evening

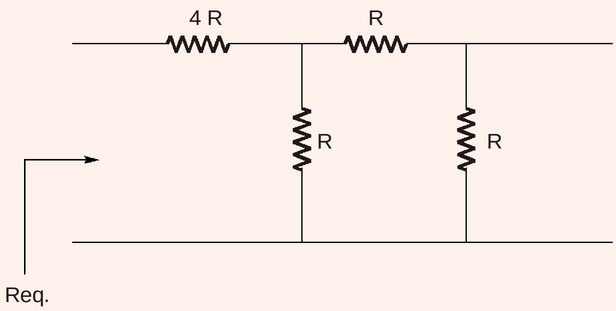
**Q.1** Find Z – parameter ($Z_{11}$, $Z_{12}$, $Z_{21}$, $Z_{22}$)




**Solution:**

$$\begin{bmatrix} \frac{3}{4} & \frac{1}{4} \\ \frac{1}{4} & \frac{3}{4} \end{bmatrix}$$

**Q.2** Find $R_{eq}$



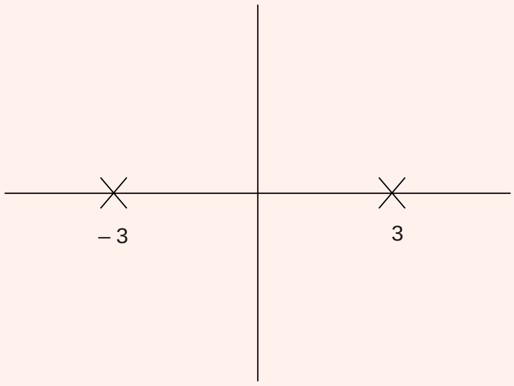

**Solution: (14R/3)**

**Q.3** A stable LTI system has a transfer function $H(S) = \frac{1}{S^2 + S - 6}$ to make this system causal it needs to be cascaded with another LTI system having T.F. $H_1$ (S). Then $H_1$(S) is

(a) S + 3
(b) S – 2
(c) S – 6
(d) S + 1

**Solution: (b)**

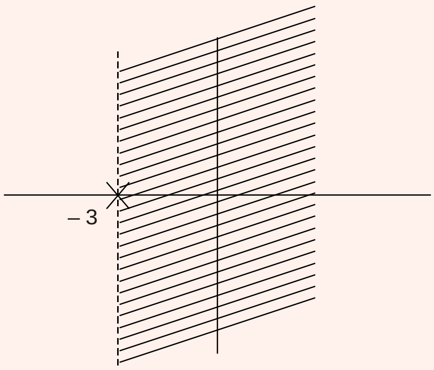
$$H(S) = \frac{1}{(S-2)(S+3)}$$




If $\quad H_1(S) = (S-2)$

then $\quad H(S)\,H_1(S) = \frac{1}{(S+3)}$

then




⇒ Casual

**Q.4** If sequence of 12 consecutive odd number are given, sum of first 5 number is 485. What is the sum of last 5 consecutive numbers.

**Solution: (555)**

$$n + (n+2) + (n+4) + (n+6) + (n+8) = 485$$

$$5n + 20 = 485$$

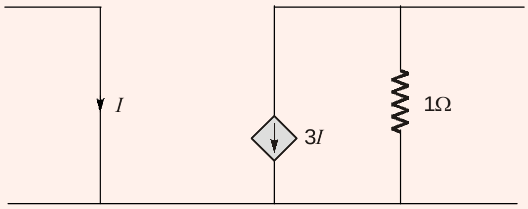
$$n = \frac{465}{5} = 93$$

$$(n+14) + (n+16) + (n+18) + (n+20) + (n+22) = ?$$

$$= 5n + 90$$

$$= 5\,(93) + 90 = 90 + 450 + 15 = 555$$

**Q.5** To find: Which circuit is this ?




(a) Voltage control, voltage source
(b) Voltage control, current source
(c) Current control, current source
(d) Current control, voltage source

**Solution: (c)**

**Q.6** If the unilateral L.T. of signal f(t) is given as $\frac{1}{S^2+S+1}$ then the Laplace transform of signal t.f(t) will be ____

(a) $\frac{1}{(S^2+S+1)^2}$
(b) $\frac{1}{S^2+S+1}$
(c) $\frac{-2S+1}{S^2+S+1}$
(d) $\frac{2S+1}{(S^2+S+1)^2}$

**Solution: (d)**

$$f(t) \leftrightarrow \frac{1}{(S^2+S+1)}$$

$$f(t) \leftrightarrow -\frac{d}{dS}\left[\frac{1}{(S^2+S+1)}\right]$$

$$= +\frac{1(2S+1)}{(S^2+S+1)^2} = \frac{(2S+1)}{(S^2+S+1)^2}$$

**Q.7** If a signal $x(n) = (0.5)^n u(n)$ is convolued with itself the signal obtained is y(n), then the value of Y(0) = _____.

**Solution: (0)**

$$y_{(n)} = (0.5)^n u(n) \times (0.5)^n u(n)$$

$$y_{(n)} = \sum_{K=-\infty}^{\infty} (0.5)^k u(k)\ (0.5)^{n-k} u(n-k)$$

$$y_{(n)} = \sum_{k=0}^{n} (0.5)^n 1; n \geq 0 = (0.5)^\circ + (0.5)^1 + .... + (0.5)^n$$

$$y_{(n)} = \frac{\left((0.5)^{n+1} - 1\right)}{-0.5} u[n]$$

$$y_{(n)} = 2\left(1 - (0.5)^{n+1}\right) u(n)$$

$$Y(z) = \frac{2z}{z-1} - \frac{z}{z-0.5}$$

$$Y(0) = 0$$

**Q.8** If $\left(\frac{2}{3}\right)^n u(n+3) \leftrightarrow \frac{A\,e^{-J6\pi f}}{1-\frac{2}{3}e^{-J2\pi f}}$ where u(n) is unit step sequence then the value of A

____

**Solution: (3.375)**

$$u(n) \leftrightarrow \frac{Z}{Z-1}$$

$$a^n u(n) \leftrightarrow \frac{Z}{Z-a}$$

$$\left(\frac{2}{3}\right)^{-3} \times \left(\frac{2}{3}\right)^{n+3} u(n+3) \leftrightarrow \left(\frac{2}{3}\right)^{-3} \times Z^{+3} \frac{Z}{\left(Z-\frac{2}{3}\right)}$$

Put $Z = e^{J\omega} = e^{J2\pi f}$

$$= \left(\frac{2}{3}\right)^{-3} \frac{e^{j6\pi f} \times e^{j2\pi f}}{\left(e^{j2\pi f} - \frac{2}{3}\right)} = \frac{\left(\frac{2}{3}\right)^{-3} e^{j6\pi f} \times e^{j2\pi f}}{e^{J2\pi f}\left(1 - \frac{2}{3}e^{j2\pi f}\right)}$$

$\therefore$ $$A = \left(\frac{2}{3}\right)^{-3} = \frac{3^3}{2^3} = \left(\frac{27}{8}\right)$$

**Q.9** If $f(x, y) = x^n y^m = P$. If x is doubled an y is halved, then which relation is true

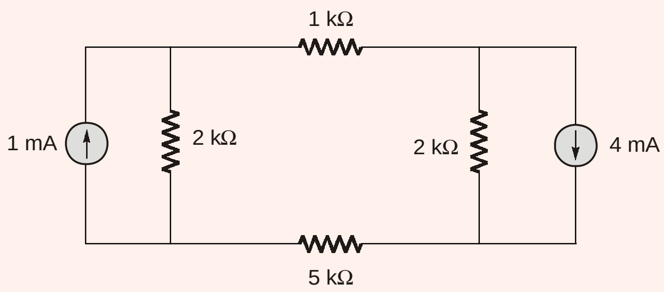
(a) $2^{n-m} P$
(b) $2^{m-n} P$
(c) $(m-n) P$
(d) $(n-m) P$

**Solution: (a)**

$$f(x,y) = (2x)^n \times \left(\frac{y}{2}\right)^m$$

$$= 2^n \times x^n \frac{y^m}{2^m} = \frac{2^n}{2^m} x^n y^m = 2^{n-m} P$$

**Q.10** Find the magnitude of current in the 1 k Ω resistor.




**Solution: (1 Ampere)**

**Q.11** If a matrix $x^{\cdot}(t) = \begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix} x(t)$. Then the state transition matrix is given as ______

(a) $\begin{bmatrix} 1 & 0 \\ 0 & e^t \end{bmatrix}$

(b) $\begin{bmatrix} 1 & e^t - 1 \\ 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 \\ te^t & 1 \end{bmatrix}$

(d) $\begin{bmatrix} 0 & 1 \\ 1 & e^t \end{bmatrix}$

**Solution: (b)**

**Q.12** If there is a telephone station where time of incoming is independent of the time of other calls coming in past or in future. Then the pdf of this system in a fixed interval of time will be ____

(a) Poisson
(b) Gaussion
(c) Gamma
(d) Binomial

**Solution: (a)**

**Q.13** If STA 1423 and starting address of the program was IFFEH. Then instruction is fetched, executed by the μP. Then the data present at the $A_{15}$ $A_8$ will be

(a) IF/ F 20 23
(b) IF IF 20 14 14
(c) IF IF 14 14
(d) IF IF FE 14

**Solution: (c)**

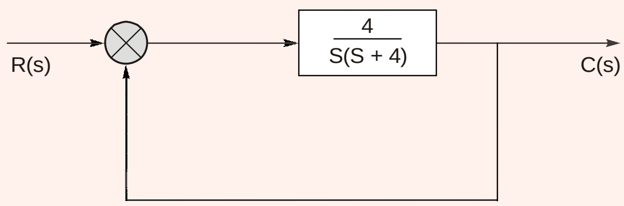
IFFE STA 1423

2000

address carried by lines $A_{15} - A_8$ is 1F, i.e.

High order address and it carries "14" after of code fetch cycle.

**Q.14** If for the given system




Then natural frequency of the system is

(a) 2
(b) 4
(c) 5
(d) 6

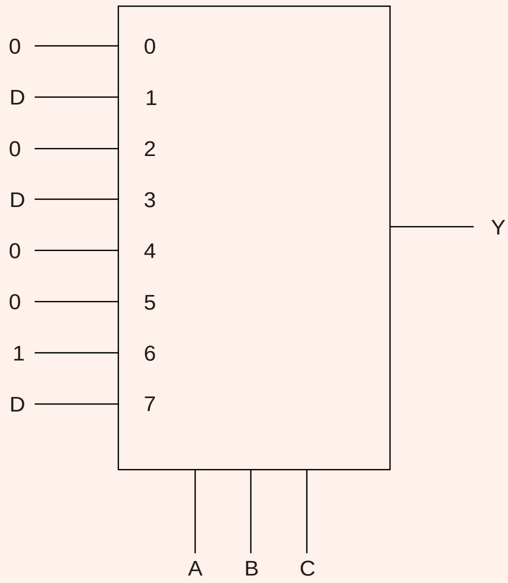
**Solution: (a)**

**Q.15** If the CE–configuration of the BJT transistor is not provided with by-pass capacitor, it will have

(a) Ri↑ Av↑
(b) Ri↑ Av↓
(c) Ri↓ Av↓
(d) Ri↓ Av↑

**Solution: (b)**

**Q.16** For the given 8 × 1 multiplex, the output will be




**Solution: (Σm(3, 7, 12, 13, 15))**

| AB \ CD | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 | 0 | 1 | 0 |
| 01 | 0 | 0 | 1 | 0 |
| 11 | 1 | 1 | 1 | 0 |
| 10 | 0 | 0 | 0 | 0 |

Σm(3, 7, 12, 13, 15).

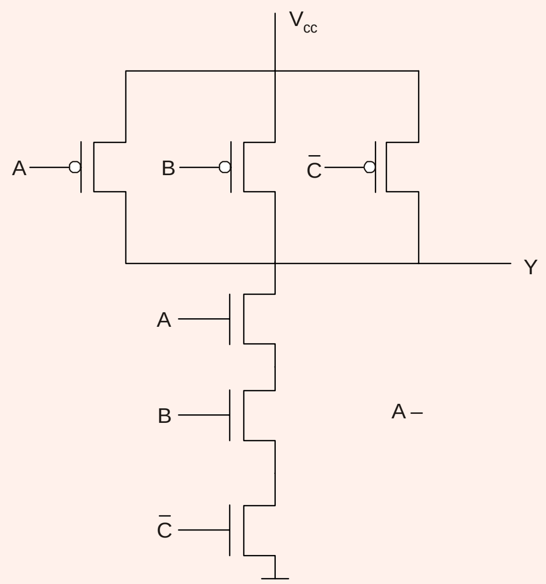
**Q.17** The equivalent output of the circuit will be

(a) A′ + B′ + C  (b) A′ B C
(c) A + B′ C  (d) None of these

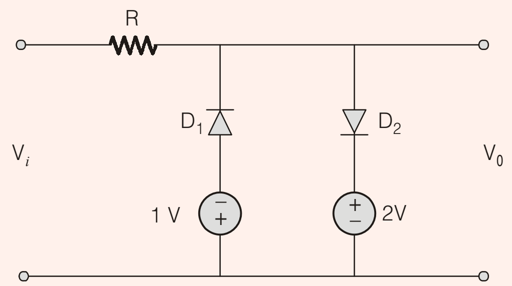
**Solution: (a)**

$$Y = \overline{A \times B \times \bar{C}}$$

$$Y = \left(\bar{A} + B + C\right)$$



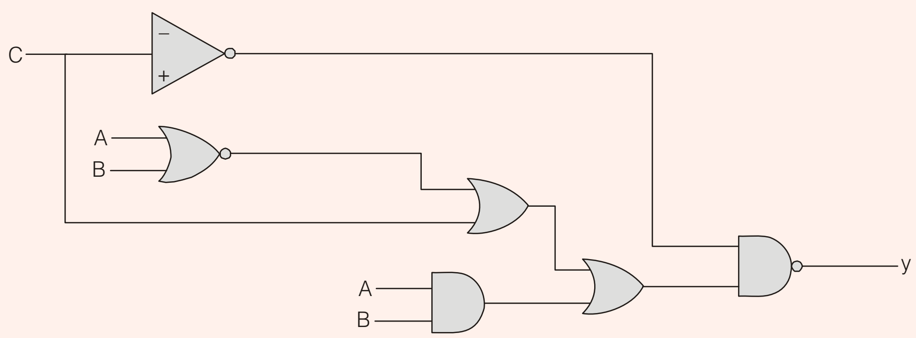

**Q.18** The output voltage $V_0$ of the circuit shown is




(a) $-0.3\text{ V} < V_0 < 1.3\text{ V}$
(b) $-0.3\text{ V} < V_0 < 2.3\text{ V}$
(c) $-1.7\text{ V} < V_0 < 2.7\text{ V}$
(d) $-1.7\text{ V} < V_0 < 1.3\text{ V}$

**Solution: (c)**

**Q.19** If c = 0 is the given logic circuit, find y.



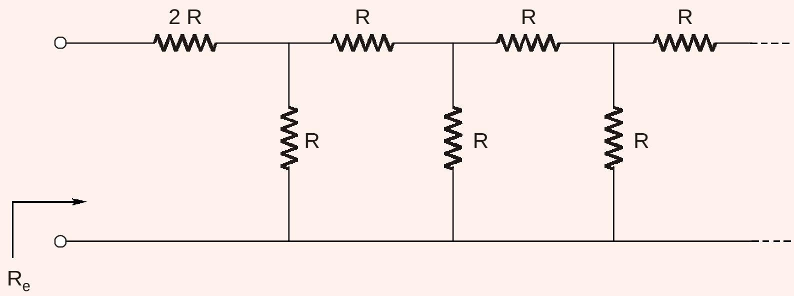

(a) $\bar{A}B + A\bar{B}$
(b) $\bar{A} + \bar{B}$
(c) A + B
(d) AB

**Solution: (a)**

$$y = \overline{\overline{A+B}+AB} = \overline{\overline{A+B}} \times \overline{AB}$$

$$= \left(\overline{\overline{A+B}}\right) \times \overline{AB} = (A+B)\left(\bar{A}+\bar{B}\right) = \bar{A}B + A\bar{B}$$

**Q.20** $R_e$ is ______ kΩ. (Assume R = 1 kΩ)

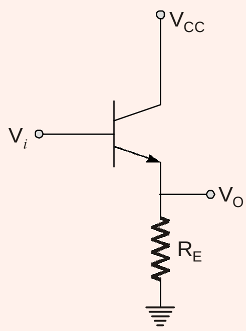



**Solution: (2.79)**

**Q.21** For an antenna radiating in free space, the Electric field at a distance of 1 km is found to be 12 mV/m. Given intrinsic impedance of free space is 120 πΩ, magnitude of average power density due to this antenna at a distance of 2 km from the antenna is __________

**Solution: (0.047)**

**Q.22** In the above diagram what is the condition satisfied so that the gain of the above common collector amplifer is constant




(a) $I_C R_E >> V_T$
(b) $I_m R_E >> 1$
(c) $RI_C << 1$
(d) $I_C R_E << V_T$

**Solution: (a)**

**Q.23** Parcels from sender S to receiver R passes. Sequentially through two post offices. Each post-offices has a probability $\frac{1}{5}$ of losing an incoming parcel, undependable of all other parcels. Given that parcel is lost, the probability that it was lost by 2$^{nd}$ post office is _____.

**Solution: (0.04)**

**Q.24** If the series is given as 13 M, 17 Q, 19 S, ____ then the next term will be

(a) 22 W
(b) 23 W
(c) 22 U
(d) 20 V

**Solution: (b)**

13 M, 17 Q, 19 S, 23 W

Place apphabet

13 M
14 N
15 O
16 P
17 Q
18 R
19 S
20 T
21 U
22 V
23 W

13, 17, 19, 23 are prime numbers.

**Q.25** A person was awarded at a function, he said he was VINDICATED. Which word is nearly related to underline word.

(a) Chastened
(b) Substantiated
(c) Pushed
(d) Defamed

**Solution: (b)**

**Q.26** A government policy was DISAGREED by the following members, which is nearly selected to underline word

(a) dissent
(b) decent
(c) descent
(d) decadent

**Solution: (a)**

**Q.27** If in a certain code system, "good luck" is certain "Kcldg" and "All the best" as "tsbhtll". Then "are the exam" is written as

(a) Mxhtr
(b) Mtzhx
(c) cMxht
(d) htcMx

**Solution: (a)**

**Q.28** The solution of the differential equation is $\frac{d^2x}{dt^2} + \frac{2dx}{dt} + x = 0$

(a) $ae^{-t}$
(b) $ate^{-t} + be^{-t} + be^{-2t}$
(c) $ae^{-t} + bte^{-t}$

Where a and b are some constant

**Solution: (c)**

**Q.29** After the discussion, Tom said to me "Please revert". He excerpts me to

(a) retract
(b) get back to him
(c) move in reverse
(d) retreat

**Solution: (b)**

**Q.30** $\sum_{0}^{\infty} \frac{1}{n!}$ = value of the sum motion equal to ________

(a) $2 l n 2$
(b) e
(c) 2
(d) $\sqrt{2}$

**Solution: (b)**

■■■■