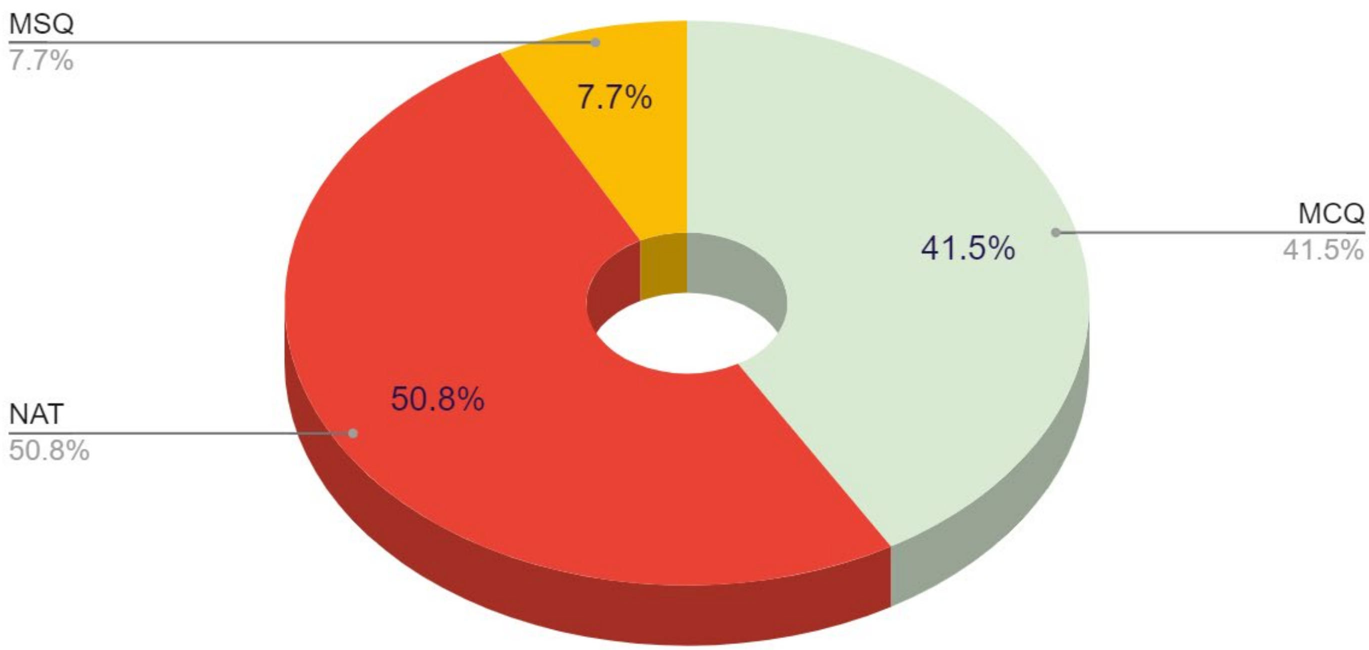
GATE 2022 Paper Analysis

Memory Based

Instrumentation Engineering

MCQ	27
NAT	33
MSQ	5



GATE 2022 Examination* (Memory Based)
Instrumentation Engineering

Test Date: 6-Feb-2022

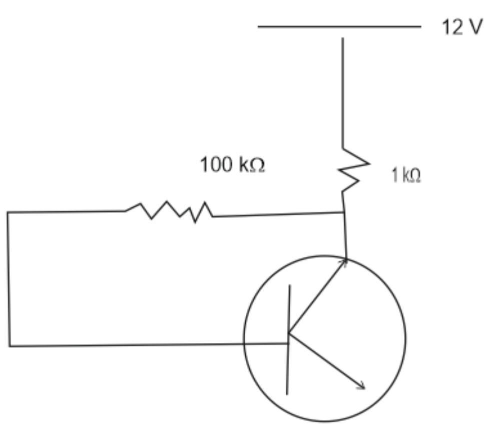
Test Time: 2:30 PM

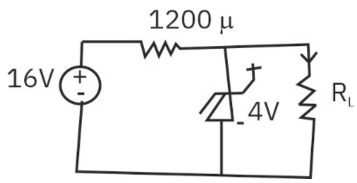
Stream Name: Instrumentation Engineering

Q1. $\frac{d}{dt}y(t) + y(t) = 3x(t-3)\,U(t-3)$. Find If $\frac{y(s)}{x(s)}$

A) $\frac{3e^{-\frac{s}{s}}}{s+1}$ B) $\frac{e^{-s+3}}{s+1}$ C) $\frac{e^{-35}s+3}{s+3}$ D) $\frac{3e^{-3s}}{s+1}$

Q.2) If V_{BE} is 0.7 V & V_{CE} = 5.2 V. Find B.



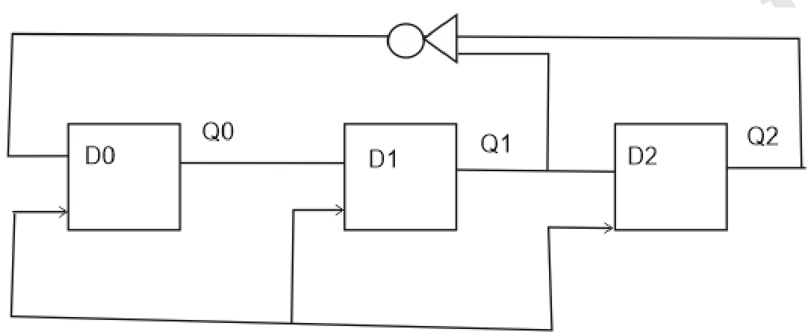


= I_L max = ?

If knee current of Zener diode is 4mA, then the maximum value of load current is

Q4. If $x(t) = (t-1)^2\, u(t-1)$. A laplace transform of x(t) is x(s).
Then find x(1)
a) e^2 b) 2e c) e^{-1} d) $2e^{-1}$

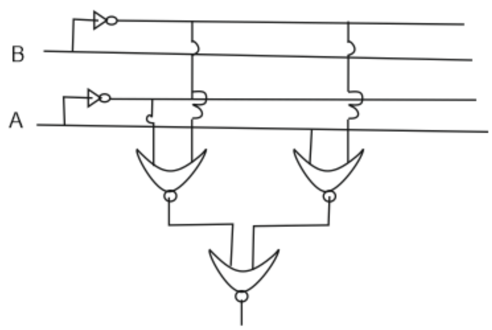
Q.5)



a) Divide by 5 counter
b) Divide by 8 counter
c) Divide by 7 counter
d) Dees with as a counter because of dispintcycle

Q6. If x(t) = x(t) Sin(2πt)
a) Non Linear & Time Variant
b) Linear & Time Variant
c) Non Linear & Time Invariant
d) Linear & Time Invariant

Q.7)



Find F.

a) A + B

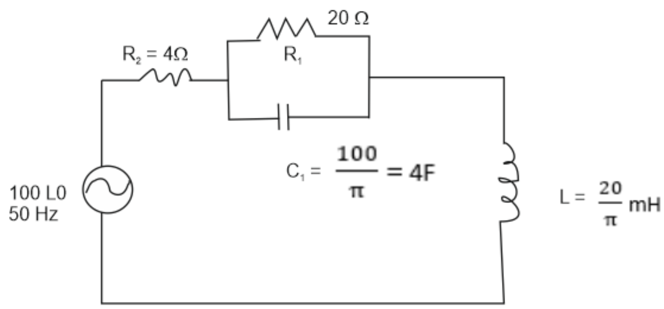
b) $A.\overline{B}$

c) $A + \overline{B}$

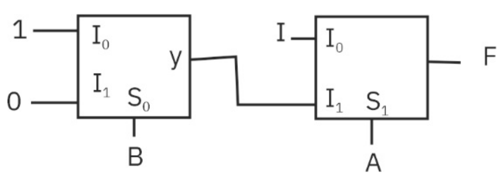
d) $\overline{B}$

Q8. In an ADC, resolution = 0.01 V and it converts analog signal b/w. ovto 10 V. The minimum number of bits (in integer) is ___________

Q.9) Find the input power factor for the given circuit?



Q10. In an ADC, ficsolution = 0.01V & it converter analog signal b/w OV to 10V. The min. no. of bits (integers) is _______



a) $\overline{A+B}$ b) $\overline{A}+\overline{B}$ c) $\overline{A.B}$ d) $\overline{A}.\overline{B}$

Q11. Consider a matrix $A = \begin{bmatrix} 2 & 3 & 7 \\ 6 & 4 & 7 \\ 4 & 6 & 14 \end{bmatrix}$

Which of the following options is/are correct.

a) |A| = 0 b) P(A) = 3

c) Rows of A are independent d) Rank of A is 2

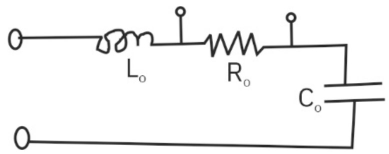
Q12. A bag contains 4 blue and 6 red balls. 3 balls are drawn in succession. The probability that 2nd and 3rd balls are red ________________________

$$\begin{bmatrix} 4 & 3 \\ 9 & -2 \end{bmatrix}$$

Which of the following eigen vector is correct.

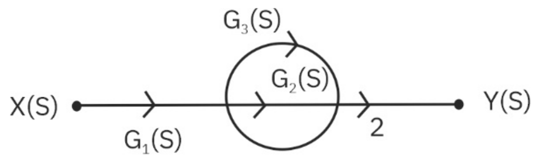
$\begin{bmatrix} 3 \\ 4 \end{bmatrix}$ $\begin{bmatrix} 2 \\ -0 \end{bmatrix}$ $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ $\begin{bmatrix} 2 \\ 8 \end{bmatrix}$

Q14. In a series RLC circuit shown in the figure $R_o = 50\ \Omega$, $L_o = 1$ mH, $C_0 = 10$ nf. The Q-factor of the circuit is ____



Q.15) The transer function of a system is $\frac{(s+1)(s+3)}{(s+5)(s+7)(s+9)}$. On the state space representation of the system, the minimum number of state variable necessary is ______________.

Q16. The signal flow graph of a system shown the expression for YQ/X(Q) is



A) $\dfrac{2G_1(s)G_2(s)+2G_1(S)G_3(S)-G_1(S)}{1+G_2(S)+G_3(S)}$

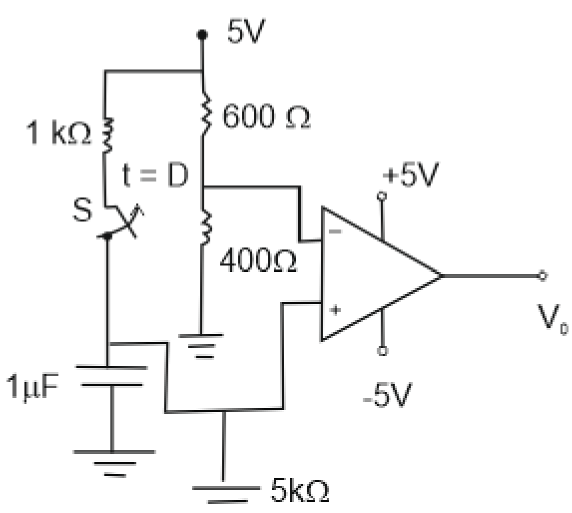
B) $2G_1(S) + G_3(S) + \dfrac{G_2(S)}{1+G_2(S)}$

C) $G_1(S) + G_2(S) - \dfrac{G_2(S)}{2+G_2(S)}$

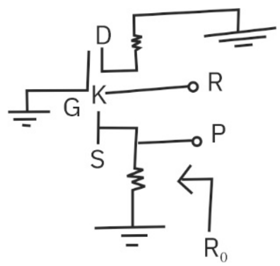
D) $\dfrac{2G_1(S)G_2(S)+2G_1(S)G_2(S)}{1+G_2(S)+G_2(S)}$

Q.17) In a given circuit switch S is closed for a long time and its open at t = 0.

Consider ideal Qp – Amp, then, find the time (msec) at which the output voltage V_0 becomes low?

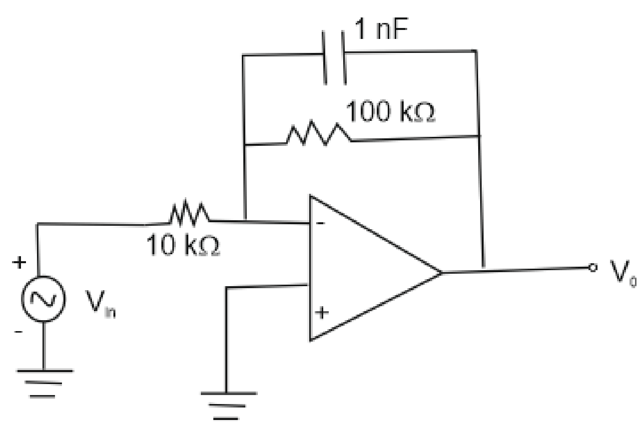


Q18. Find the output impedence of the given Amplifier is



A) R_S || 1/gm B) R_S || R_L || 1/gm C) (R_S + R_L) || 1/gm D) $\frac{R_L gm}{1+gmR_S}$

Q.19) The circuit is driven by a sinusoidal input resulting in output voltage V_0. The frequency (in kHz) - _____________ at which the voltage gain is od B.



Q20. A photo diode is made up of semi-conductor with an energy band of 1.42 eV and planks constant is 6.626×10^{-34} J. The speed of light is 3×10^8m/s and 1 eV = 1.6×10^{-19}J. The cut off wavelength is __________ nm.

Q21. In which of the following bridge (s) is the balancing condition frequency independent.

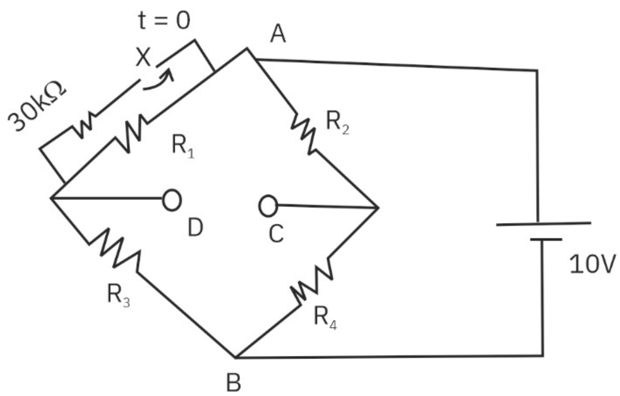
a) Wheatstone bridge b) Wien bridge

c) Sheering bridge d) Maxwell bridge

Q22. Hall sensor is based on principle of

a) Photo electric-effect
b) Piezoelectric-effect
c) Lorentz Force
d) Seeback

Q23.



In a given Wheatstone bridge. $R_1 = 1.5\ k\ \Omega$, $R_2 = R_3 = R_4 = 1k\ \Omega$

Switch is initially open and voltage is observed between CD is V_{CD}. When switch is closed the resistance R1 is changes by Δ R, then the sensitivity at t = 0 $\left(\frac{V}{R_2}\right)\left|\frac{\Delta V_{CD}}{\Delta R_1}\right|$ is

$$\frac{6}{S(S-S)}$$

The closed loop system will be

a) Casual & Unstable
b) Non-casual & stable
c) Non-casual & Unstable
d) Casual and Stable

Q.25) In a digital comparator having a_1a_0 & b_1b_0 for condition A > B the condition will be:

a) $a_1\overline{b_1} + a_0\,\overline{b_1}\,\overline{b_0} + a_1\,a_0\overline{b_0}$

b) $\overline{a_1}b_1 + \overline{a_0}\,b_1\overline{b_0} + \overline{a_1}\,\overline{a_0}\,b_0$

c) $\overline{a_1}\overline{b_1} + \overline{a_0}\,\overline{b_1}\,b_0 + a_1\,a_0\overline{b_0}$

d) $\overline{a_1} + \overline{b_1} + a_0\,\overline{a_0}\,b_0\,\overline{b_1}$

Q26. A signal x(t) is band limited between 100 Hz 8200 Hz. A signal y(t) = x(2t - s). The statement that also be true.

a) y(t) is band limited b/w 200 Hz & 400 Hz

b) y(t) is not band limited

c) y(t) is band limited between 50 Hz and 100 Hz

d) y(t) is band limited between 100 Hz and 200 Hz

Q.27) A sinusoidal carrier with amplitude A_c and frequency f_c is amplitude modulated with a message signal m(t) having frequency $o < f_m < f_c$ to generate modulated wave s(t) given by:

$s(t) = Ac\,(1 + m(t))\cos 2\pi f_c t$

The message signal that can be retrieved completly using envelope detection is:

a) $m(t) = 2\cos(4\pi f_c t)$

b) $m(t) = 2\sin(4\pi f_c t)$

c) $m(t) = 0.5\cos(2\pi f_c t)$

d) $m(t) = 1.5\sin(2\pi f_c t)$

Q28. Consider 24 voice signals being transmitted without latency using time division multiplexing. If each signal is sampled at 12 kHz and represented by an 8-bit word, the bit duration in microsecond is:

Q29. 440v, 8kw 4 pole 50 Hz star connected induction motor has a full load slip of 0.04. The rotor speed (in r pm) in full load is__________