Gate Problems on Circuit Analysis

***Abstract*—This problem set has questions related to RLC circuits taken from GATE papers over the last twenty years. Teachers can use the problem set for course tutorials.**

1) In a series RLC high Q circuit,the current peaks at a frequency
   a) Equal to the resonant frequency.
   b) Greater than the resonant frequnecy.
   c) Less than the resonant frequency.
   d) None of the above.

2) The network shown in figure.1 is initially under steady state condition with the switch in position1.The switch is moved from position1 to position2 at $t \neq 0$.Calculate the current i(t) through R$_1$ after switching.

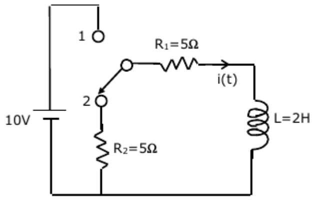

Fig. 1

3) For the series R-L circuit of figure(a)2, the partial fissure diagram at a certain frequency is shown in figure(b).The operating frequency of the circuit is:
   a) Equal to the resonance frequency.
   b) Less than the resonance frequency.
   c) Greater than resonance frequency.
   d) Not zero.

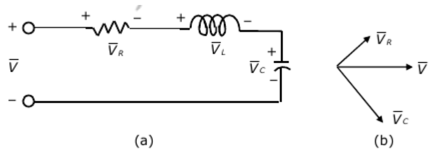

Fig. 2

4) For the compensated attenuator of figure3, the impulse response under the condition R$_1C_1$ = R$_2C_2$ is:

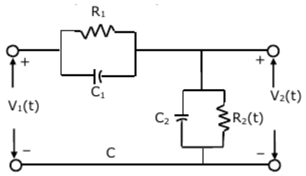

Fig. 3

   a) $\frac{R_2}{R_1+R_2}\left[1-e^{\frac{1}{R_1C_1}}\right]$u(t)
   b) $\frac{R_2}{R_1+R_2}\delta$(t)
   c) $\frac{R_2}{R_1+R_2}$ u(t)
   d) $\frac{R_2}{R_1+R_2}1-e^{\frac{1}{R_1C_1}}$u(t)

5) Of the four networks N$_1$,N$_2$,N$_3$ and N$_4$ of figure4, the networks having identical driving point functions are
   a) $N_1 and N_1$
   b) $N_2 and N_4$
   c) $N_1 and N_3$
   d) $N_1 and N_4$

6) In the series circuit shown in figure.5 for series

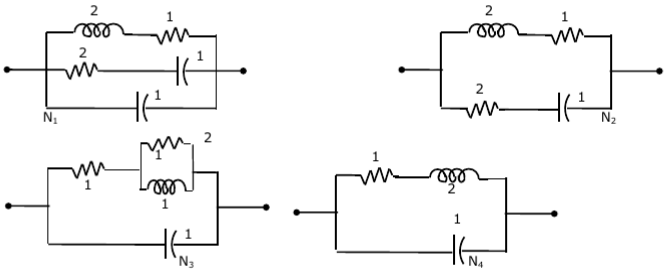

Fig. 4

resonance,the value of the coupling coefficient K will be

a) 0.25 b) 0.5 c) 0.999 d) 1.0

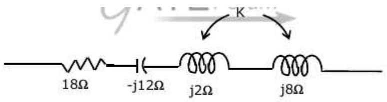

Fig. 5

7) In the circuit of figure.6, when switch S_1 is closed,the ideal ammeter M_1 reads 5A.What will be ideal voltmeter M_2 read when S_1 is kept open?(The value of E is not specified).

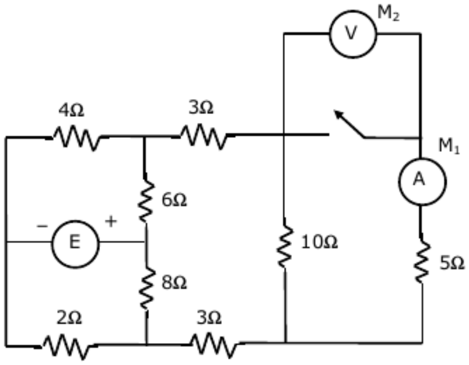

Fig. 6

8) In figure.7 A_1,A_2andA_3 are ideal ammeters?If A_1 reads 5A,A_2 reads 12A, then A_3 should read.

a) 7A b) 12A c) 13A d) 17A

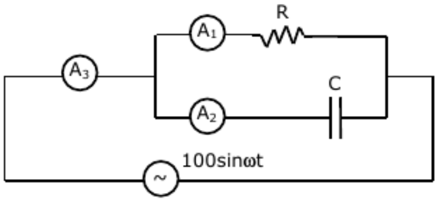

Fig. 7

9) Find the Y-parameters(short circuit admittance parameters)for the network shown in figure.8

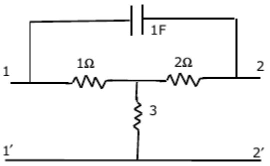

Fig. 8

10) The voltages V_{c1},V_{c2} and V_{c3} across the capacitors in the circuit in the given figure9,under steady state are respectively

a) 80V,32V,48V c) 20V,8V,12V

b) 80V,48V,32V d) 20V,12V,8V

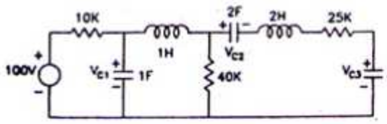

Fig. 9

11) In the circuit shown in figure10 is (a)-(c),assuming initial voltage and capacitors and currents through the inductors to be zero at the time of switching(t=0),then at anytime $t > 0$

a) Current increases monotonically with time

b) Current decreases monotonically with time

c) Current remains constant at V/R

d) Current first increases then decreases

e) No current can ever flow

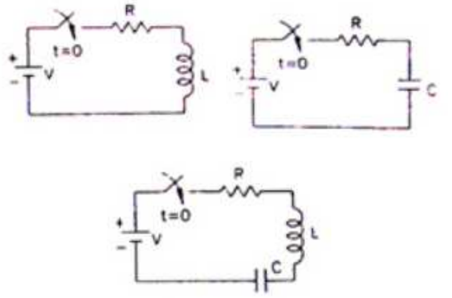

Fig. 10

12) The current i_4 in the circuit of the figure11 is equal to

a) 12A b) -12A c) 4A d) None of these

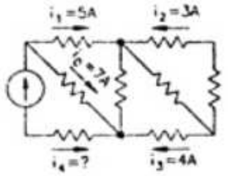

Fig. 11

13) The voltage V in the figure12 is equal to

a) 3V b) -3V c) 5V d) None of these

14) The voltage V in the figure13 is always equal to

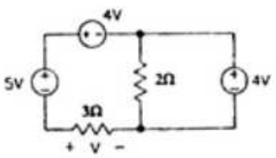

Fig. 12

a) 9V b) 5V c) 1V d) None of these

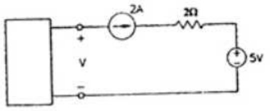

Fig. 13

15) The voltage V in the figure14 is

a) 10V c) 5V

b) 15V d) None of these

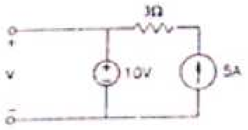

Fig. 14

16) In the circuit of the figure15 is the energy absorbed by the 4Ω resistor in the time interval (0,∞) is

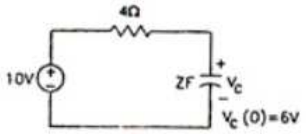

Fig. 15

a) 36 Joules

b) 16 Joules

c) 256 Joules

d) None of these

17) In the circuit of the figure16 is the equivalent impedance seen across terminals a,b is

a) $\left(\frac{16}{3}\right)\Omega$

b) $\left(\frac{8}{3}\right)\Omega$

c) $\left(\frac{8}{3}+12j\right)\Omega$

d) None of above

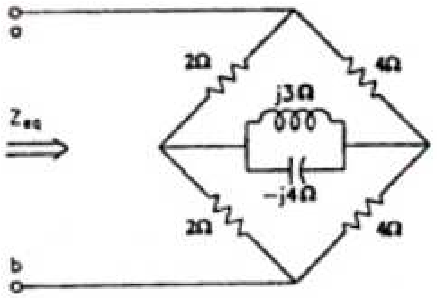

Fig. 16

18) A communication channel has first order low pass transfer function.The channel is used to transmit pulses at a symbol rate greater than the half-power frequency of the low pass function.Which of the network shown in the figure17 is can be used to equalise the received pulses?

19) In the circuit of the figure18 is R=100Ω,L=20 nH and C=32pF.The circuit is maintained at a temperature of 300k.Derive and plot the power spectral density of the voltage V_0.Mark all the relevant points on the plot with numerical values.(The Boltzmann constant k=1.28×10-23J/k)

20) In the circuit of figure19 when R=0Ω,the current i_k equals 10A

a) Find the value of R for which it absorbs maximum power

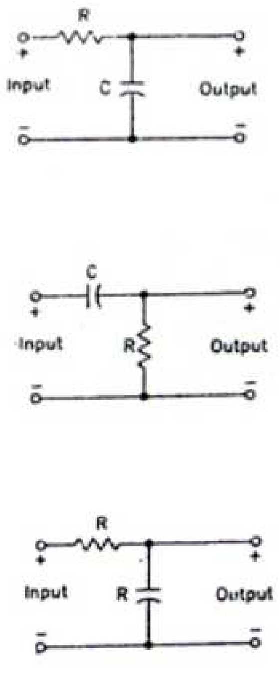

Fig. 17

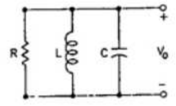

Fig. 18

b) Find the value of ε

c) Find V_2 when R=∞(open circuit)

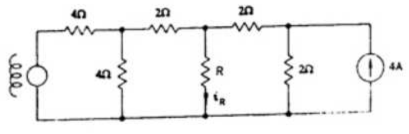

Fig. 19

21) In the circuit of the figure.20 is all currents and voltages are sinusoids of frequency ω rad/sec.

a) Find the impedance to the right of(A,B) at ω=0 rad/sec and ω=∞ rad/sec.

b) if $\omega = \omega_0$ rad/sec and i_1(t)=I sin(ω_0t) A,where I is positive $\omega_0 \neq 0$,$\omega_0 \neq \infty$ then find I,ω_0 and i_2(t)

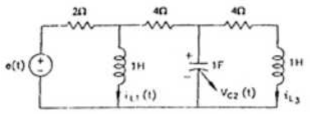

Fig. 20

22) The nodal method of circuit analysis is based on
    a) KVL and Ohm's law
    b) kCL and Ohm's law
    c) KCL and KVL
    d) KCL,KVL and Ohm's law

23) Superposition theorem is NOT applicable to networks containing
    a) Nonlinear elements
    b) Dependent Voltage Sources
    c) Dependent current sources
    d) transformers

24) The parallel RLC circuit shown in figure.21 is in resonance.In this circuit
    a) |I$_R$| <1mA
    c) |I$_R$+I$_C$| <1mA
    b) |I$_R$+I$_L$| >1mA
    d) |I$_R$+I$_C$| >1mA

25) The Voltage across the terminals a and b in figure.22 is

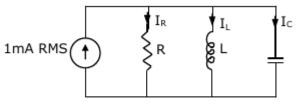

Fig. 21

a) 0.5V b) 3.0V c) 3.5V d) 4.0V

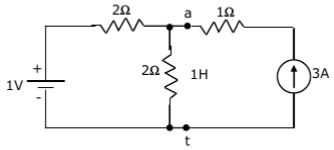

Fig. 22

26) Determine the frequency of resonance and the resonant impedance of the parallel circuit shown in Figure.23.What happens when L = CR^2 ?

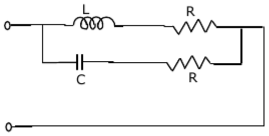

Fig. 23

27) The Thevenin equivalent voltage V$_{TH}$appearing between the terminals A and B of the network shown in Fig.24 is given by
    a) j16(3-j4)
    c) 16(3+j4)
    b) j16(3+j4)
    d) 16(3-j4)

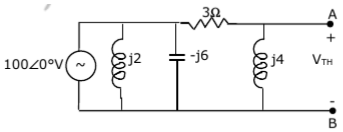

Fig. 24

28) The value of R (in ohms) required for maximum power transfer in the network shown in Fig.25 is

a) 2 b) 4 c) 8 d) 10

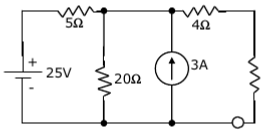

Fig. 25

29) A Delta-connected network with its Wye-equivalent is shown in Fig26,fig27.The resistance R_1,R_2 and R_3 (in ohms) are respectively

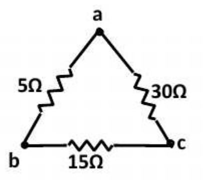

Fig. 26

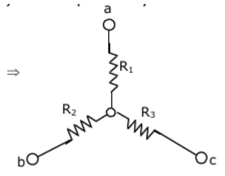

Fig. 27

30) In the circuit of Fig.28,the switch 'S' has remained open for a long time. The switch closes instantaneously at t=0

a) Find V_0 for t$\leq$0 and as t$\rightarrow \infty$

b) Write an expression for V_0 as function of time for 0$\leq$t$\leq \infty$

c) Evaluate V_0 at t=25 μsec

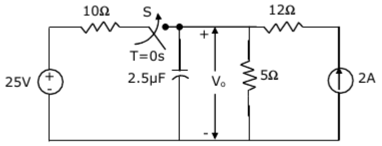

Fig. 28

31) For the network shown in Fig.29 evaluate the current I flowing through the 2Ω resistor using superposition theorem.

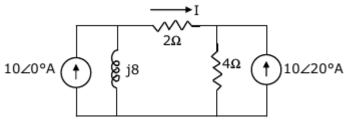

Fig. 29

32) In the circuit of Fig.30 the voltage v(t)is

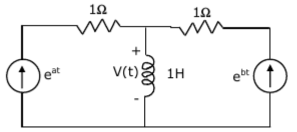

Fig. 30

a) e^{at}-e^{bt}

c) ae^{at}-be^{bt}

b) e^{at}+e^{bt}

d) ae^{at}+be^{bt}

33) The circuit of figure.31 represents a

a) low pass filter

c) band pass filter

b) high pass filter

d) band reject filter

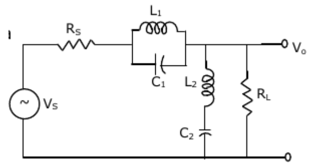

Fig. 31

34) Use the data of figure.32 .The current I in the circuit of figure(b) is

a) -2A b) 2A c) -4A d) +4A

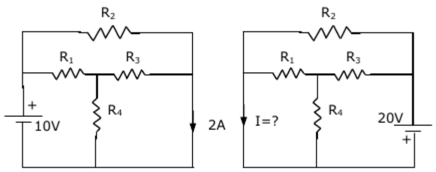

Fig. 32

35) For the circuit in figure.33

a) Find the Thevenin equivalent of the sub circuit faced by the capacitor across the terminals a,b.

b) Find v_c(t),t>0,given V_c(0)=0

c) Find i(t),t>0

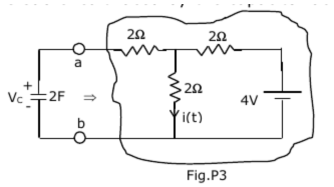

Fig. 33

36) For the circuit in figure34,which is in steady state.

a) Find the frequency ω_0 at which the magnitude of the impedance across terminals a,b reaches a maximum.

b) Find the impedance across a,b at the frequency ω_0.

c) if v_s(t)=V sin(ω_0t),find i_L(t),i_R(t).

37) For the circuit in figure35,write the state equations using v_c and i_L as state variables

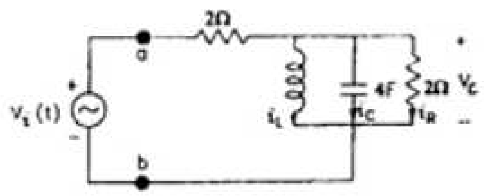

Fig. 34

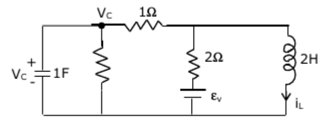

Fig. 35

38) The voltage e_0 in figure36 is

a) 2V b) $\frac{4}{3}$ V c) 4V d) 8V

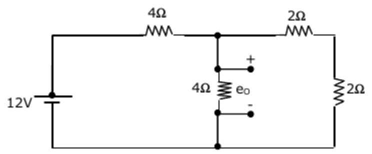

Fig. 36

39) The voltage e_0 in figure37 is

a) 48V b) 24V c) 36V d) 28V

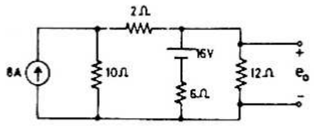

Fig. 37

40) In figure38,the value of the load resistor R which maximizes the power delivered to it is

a) 14.14Ω c) 200Ω

b) 10Ω d) 28.28Ω

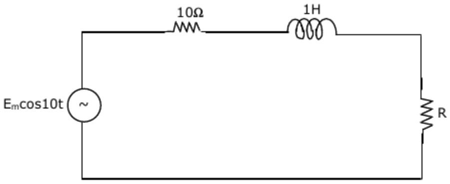

Fig. 38

41) When the angular frequency ω in Figure39 is varied from 0 to ∞, the locus of the current phasorI_2 is given by

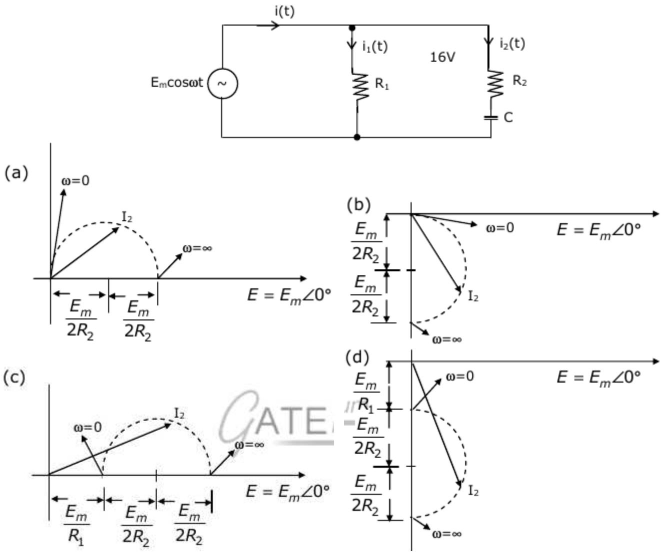

Fig. 39

42) For the circuit shown in figure40,determine the phasors E_2,E_0,I and I_1

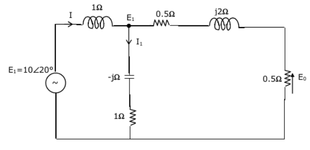

Fig. 40

43) The circuit shown in figure41 is operating in steady-state with switch S_1 closed.

a) Find $i_L(0^+)$

b) Find $e_1(0^+)$

c) Using nodal equations and Laplace transform approach,find an expression for the voltage across the capacitor for all $t > 0$.

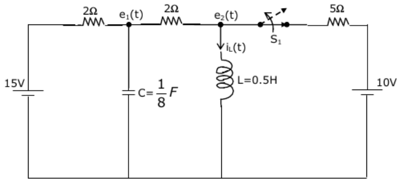

Fig. 41

44) The dependent current source shown in figure42

a) delivers 80W

b) absorbs 80W

c) delivers 40W

d) absorbs 40W

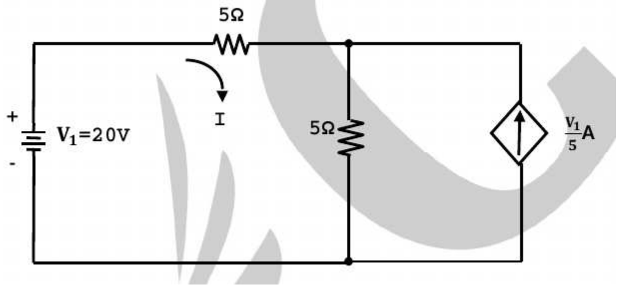

Fig. 42

45) In figure43,the switch was closed for a long time before opening at t=0.the voltage V_x at t=0$^+$is

a) 25V

b) 50V

c) -50V

d) 0V

46) In the network of figure44,the maximum power is delivered to R_L if its value is

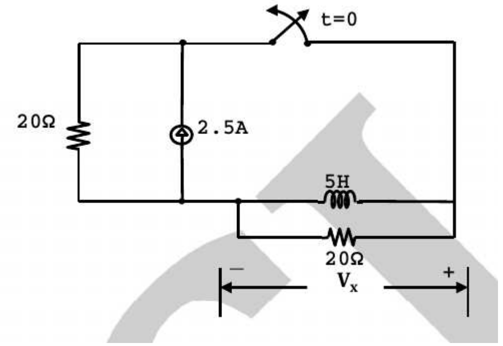

Fig. 43

a) 16Ω b) $\frac{40}{3}\Omega$ c) 60Ω d) 20Ω

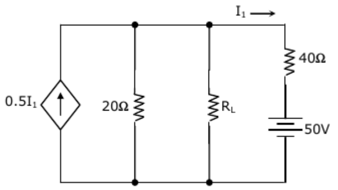

Fig. 44

47) The switch in Figure.45 has been in position1 for a long time and is then moved to position2 at t=0.
   a) Determine $V_c(0^+)$ and $I_L(0^+)$
   b) Determine $\frac{dV_c(t)}{dt}$ at t=0^+
   c) Determine $V_c(t)$ for $t > 0$

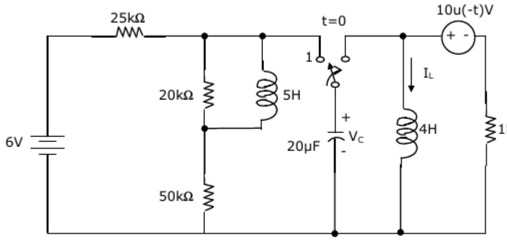

Fig. 45

48) For the network shown in Figure.46,R=1 KΩ,L_1 = 2H, L_2 = 5H,L_3 = 1H,L_4 = 4H and C=0.2μF.The mutual inductances are M_{12}=3H and M_{34}=2H. Determine
   a) the equivalent inductance for the combination of L_3andL_4.
   b) the equivalent inductance across the points A and B in the network.
   c) the resonant frequency of the network.

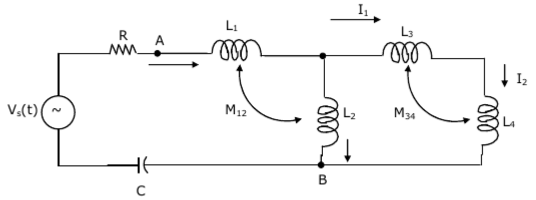

Fig. 46

49) The minimum number of equations required to analyze the circuit shown in figure.47
   a) 3
   b) 4
   c) 6
   d) 7

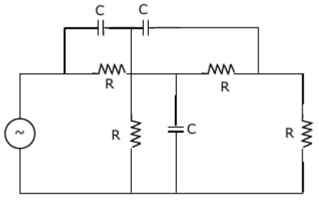

Fig. 47

50) A source of angular frequency 1 rad/sec has a source impedance consisting of 1Ω resistance in series with 1H inductance.The load that will obtain the maximum power transfer is
   a) 1Ω resistance
   b) 1Ω resistance in parallel with 1H inductance
   c) 1Ω resistance in series with 1F capacitor

d) 1Ω resistance in parallel with 1F capacitor

51) A series RLC circuit has a resonance frequency of 1 kHz and a quality factor Q=100. If each R,L and C is doubled from its original value,the new Q of the circuit is

a) 25 b) 50 c) 100 d) 200

52) The differential equation for the current i(t) in the circiut of figure.48 is

a) $2\frac{d^2i}{dt^2}+2\frac{di}{dt}+i(t)=\sin t$

b) $\frac{d^2i}{dt^2}+2\frac{di}{dt}+2i(t)=\cos t$

c) $2\frac{d^2i}{dt^2}+2\frac{di}{dt}+i(t)=\cos t$

d) $\frac{d^2i}{dt^2}+2\frac{di}{dt}+2i(t)=\sin t$

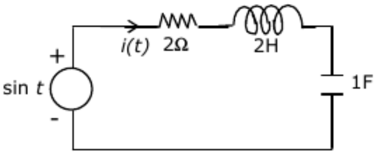

Fig. 48

53) Twelve 1Ω resistances are used as edges to form a cube. The resistance between two diagonally opposite corners of the cube is

a) $\frac{5}{6}\Omega$ b) $\frac{1}{6}\Omega$ c) $\frac{6}{5}\Omega$ d) $\frac{3}{2}\Omega$

54) The current flowing through the resistance R in the circuit in figure.49 has the form P cos 4t,where P is

a) (0.18+j0.72)

b) (0.46+j1.90)

c) -(0.18+j1.90)

d) -(0.192+j0.144)

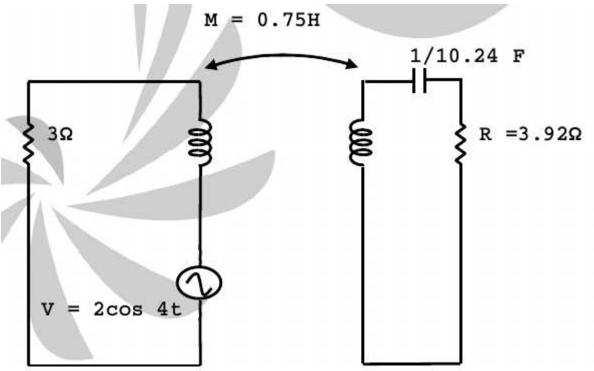

Fig. 49

55) The circuit for Q.55-56 is given in figure.50. For both the questions, assume that the switch S is in position1 for a long time and thrown to position2 at t=0.At t=0^+, the current i_1 is

a) $\frac{-V}{2R}$

b) $\frac{-V}{R}$

c) $\frac{-V}{4R}$

d) zero

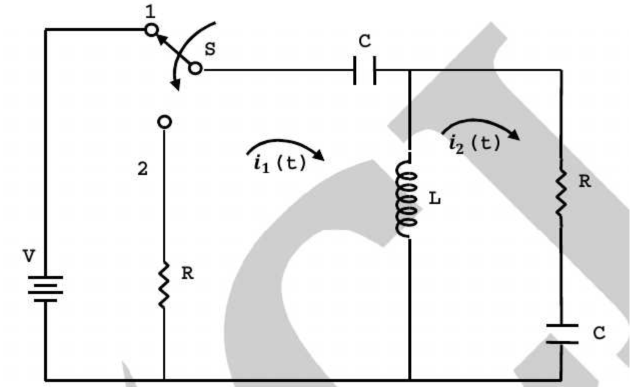

Fig. 50

56) I_1(s) and I_2(s) are the Laplace transforms of i_1(t) and i_2(t)respectively.The equations for the loop currents I_1(s)and I_2(s) for the circuit shown in figure Q.55-56, after the switch is brought from position1 to position2 at t=0,are

a) $$\begin{bmatrix} R+L_s+\frac{1}{C_s} & -L_s \\ -L_s & R+\frac{1}{C_s} \end{bmatrix} \begin{bmatrix} I_1(s) \\ I_2(s) \end{bmatrix} = \begin{bmatrix} \frac{V}{s} \\ 0 \end{bmatrix}$$

b) $\begin{bmatrix} R+L_s+\frac{1}{C_s} & -L_s \\ -L_s & R+\frac{1}{C_s} \end{bmatrix} \begin{bmatrix} I_1(s) \\ I_2(s) \end{bmatrix}$ = $\begin{bmatrix} -\frac{V}{s} \\ 0 \end{bmatrix}$

c) $\begin{bmatrix} R+L_s+\frac{1}{C_s} & -L_s \\ -L_s & R+L_s+\frac{1}{C_s} \end{bmatrix} \begin{bmatrix} I_1(s) \\ I_2(s) \end{bmatrix}$ = $\begin{bmatrix} \frac{V}{s} \\ 0 \end{bmatrix}$

d) $\begin{bmatrix} R+L_s+\frac{1}{C_s} & -L_s \\ -L_s & R+L_s+\frac{1}{C_s} \end{bmatrix} \begin{bmatrix} I_1(s) \\ I_2(s) \end{bmatrix}$ = $\begin{bmatrix} -\frac{V}{s} \\ 0 \end{bmatrix}$

57) An input voltage v(t)=10$\sqrt{2}$ cos(t+10°)+10$\sqrt{3}$ cos(2t+10°)V is applied to a series combination of resistance R=1Ω and an inductance L=1H. The resulting steady state current i(t) in ampere is

a) 10 cos(t+55°)+10 cos(2t+10°+$\tan^{-1}$2)

b) 10 cos(t+55°)+10$\sqrt{\frac{3}{2}}cos(2t+55°)$

c) 10 cos(t-35°)+10 cos(2t+10° $-\tan^{-1}$2)

d) 10 cos(t-35°)+10$\sqrt{\frac{3}{2}}cos(2t-35°)$

58) The equivalent inductance measured between the terminals1 and2 for the circuit shown in figure.51,is

a) L_1+L_2+M   c) L_1+L_2+2M

b) L_1+L_2-M   d) L_1+L_2-2M

59) The circuit shown in figure.52 with R=$\frac{1}{3}$W, L=$\frac{1}{4}$H, C=3F has input voltage v(t)=sin2t.The resulting current i(t) is

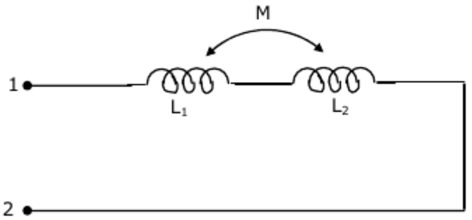

Fig. 51

a) 5sin(2t+53.1°)   c) 25sin(2t+53.1°)

b) 5sin(2t-53.1°)   d) 25sin(2t-53.1°)

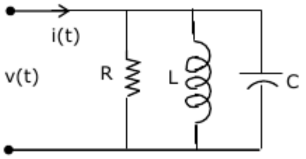

Fig. 52

60) For the circuit shown in Figure.53,the time constant RC=1ms.The input voltage is v_1(t)=$\sqrt{2}sin10^3t$.The output voltage v_0(t) is equal to

a) sin$(10^3t-45°)$ c) sin$(10^3t-53°)$

b) sin$(10^3t+45°)$ d) sin$(10^3t+53°)$

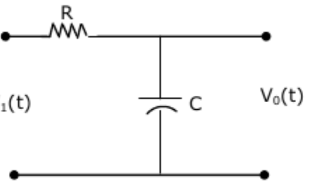

Fig. 53

61) For the R-L circuit shown in Figure.54,the input voltage v_i(t)=u(t).The current i(t) is

62) The circuit shown in Figure.55 has initial current $i_L(0)$ = 1A through the inductor and an

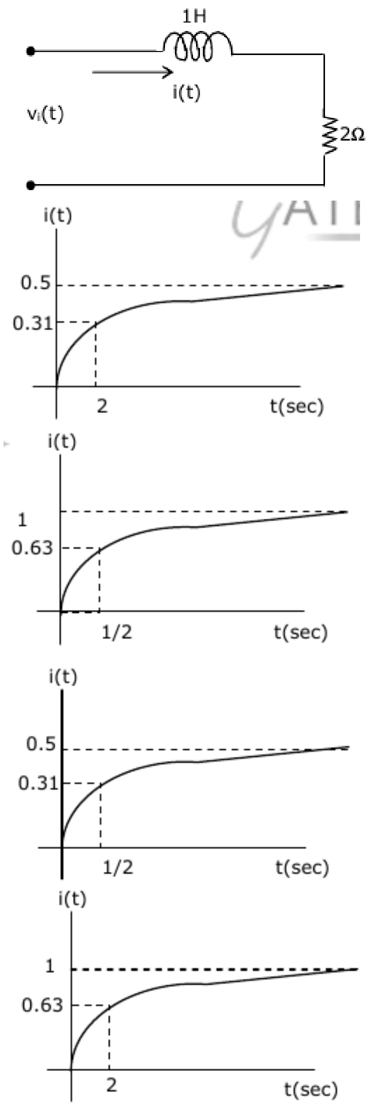

Fig. 54

initial voltage $V_c(0)$ = -1V across the capacitor. For input v(t) = u(t), the Laplace transform of the current i(t) for t≥0 is

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

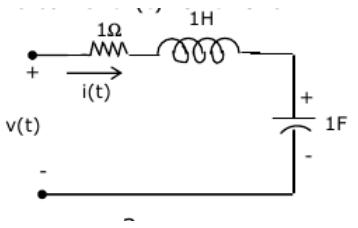

Fig. 55

63) For the circuit shown in Figure.56,the initial conditions are zero.Its transfer function H(s)=$\frac{V_c(S)}{V_1(s)}$ is

a) $\frac{1}{s^2+10^6s+10^6}$
c) $\frac{10^3}{s^2+10^3s+10^6}$
b) $\frac{10^6}{s^2+10^3s+10^6}$
d) $\frac{10^6}{s^2+10^6s+10^6}$

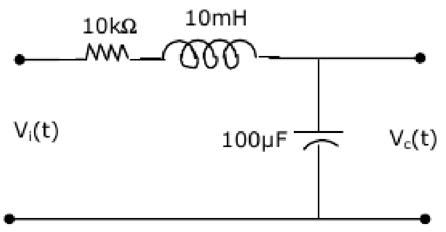

Fig. 56

64) The condition on R,L and C such that the step response y(t) in figure.57 has no oscillations,is

a) R$\geq \frac{1}{2}\sqrt{\frac{L}{C}}$
c) R$\geq 2\sqrt{\frac{L}{C}}$
b) R$\geq \sqrt{\frac{L}{C}}$
d) R=$\frac{1}{\sqrt{LC}}$

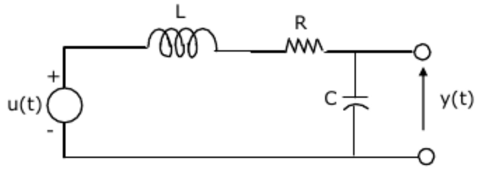

Fig. 57

65) In a series RLC circuit R=2kΩ, L=1H and C=$\frac{1}{400}\mu$F.The resonant frequency is

a) 2×10^4 Hz
c) 10^4 Hz
b) $\frac{1}{\pi}\times10^4$ Hz
d) $2\pi\times10^4$ Hz

66) The maximum power that can be transferred to the load resistor R_L from the voltage source in figure.58 is

a) 1W b) 10W c) 0.25W d) 0.5W

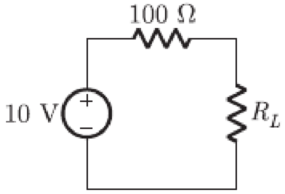

Fig. 58

67) For the circuit in figure.59 the instantaneous current i_1(t) is

a) $\frac{10\sqrt{3}}{2}\angle 90^\circ$ Amps c) $5\angle 60^\circ$ Amps

b) $\frac{10\sqrt{3}}{2}\angle -90^\circ$ Amps d) $5\angle -60^\circ$ Amps

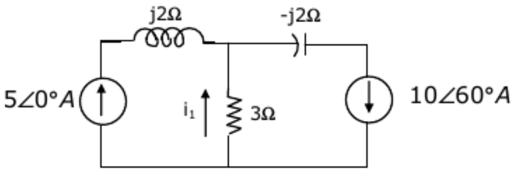

Fig. 59

68) Impedance Z as shown in figure.60 is:

a) j29Ω c) j19Ω

b) j9Ω d) j39Ω

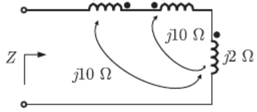

Fig. 60

69) For the circuit shown in figure.61,Thevenin's voltage and

a) 5V and 2Ω c) 4V and 2Ω

b) 7.5V and 2.5Ω d) 3V and 2.5Ω

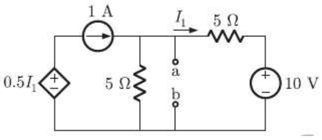

Fig. 61

70) If R_1=R_2=R_4andR_3 = 1. 1R in the bridge circuit shown in figure.62, then the reading in the ideal voltmeter connected between a and b is

a) 0.238 V c) -0.238 V

b) 0.138 V d) 1 V

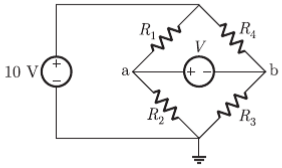

Fig. 62

71) A square pulse of 3 volts amplitude is applied to C-R circuit shown in figure.63. The capacitor is initially uncharged. The ouput voltage v_0 at time t=2 sec is

a) 3V b) -3V c) 4V d) -4V

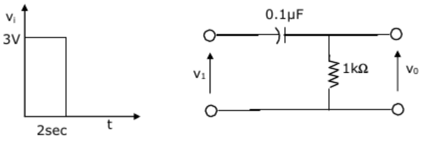

Fig. 63

72) In the figure.64 shown below, assume that all the capacitors are initially uncharged. If v_i(t)=10u(t) Volts, v_0(t) is given by

a) $8e^{-0.004t}$ Volts
b) $8(1-e^{-0.004t})$
c) 8u(t) Volts
d) 8 Volts

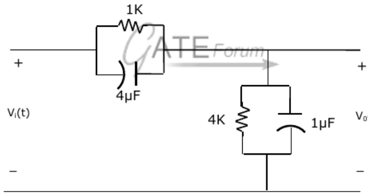

Fig. 64

73) The RC circuit shown in the figure.65 is

a) a low-pass filter
b) a high-pass filter
c) a band-pass filter
d) a band-reject filter

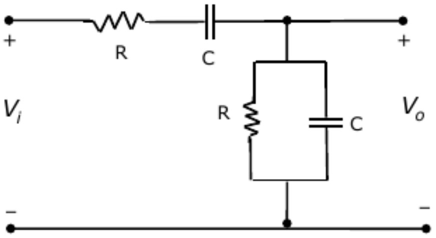

Fig. 65

74) Two series resonant filters are as shown in the figure.66. Let the 3-dB bandwidth of Filter1 be B_1 and that of Filter2 be B_2.The value of $\frac{B_1}{B_2}$ is:

a) 4
b) 1
c) $\frac{1}{2}$
d) $\frac{1}{4}$

75) For the circuit shown in the figure.67, the Thevenin voltage and resistance looking into X-Y

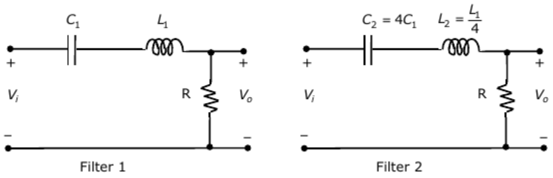

Fig. 66

a) $\frac{4}{3}$V,2Ω
b) 4V,$\frac{2}{3}$Ω
c) $\frac{4}{3}$V,$\frac{2}{3}$Ω
d) 4V,2Ω

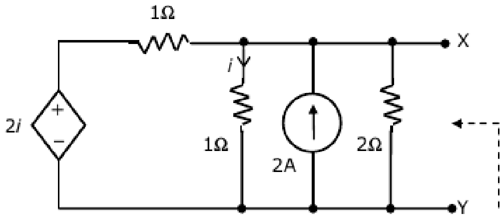

Fig. 67

76) In the circuit shown in figure.68, $V_c$is 0 volts at t=0 sec. For t>0,the capacitor current $i_c(t)$, where t is in seconds, is given by

a) 0.50 exp(-25t)mA
b) 0.25 exp(-25t)mA
c) 0.50 exp(-12.5t)mA
d) 0.25 exp(-6.25t)mA

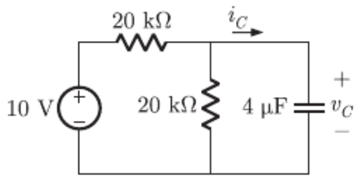

Fig. 68

77) In the AC network shown in the figure.69,the phasor voltage V_{AB}(in Volts) is:

a) 0

b) $5\angle 30°$

c) 12.5∠30°

d) 17∠30°

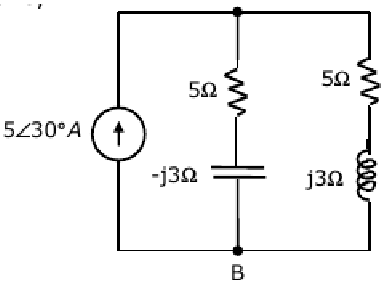

Fig. 69

78) The Thevenin's equivalent impedance Z_{TH} between the nodes P and Q in the following figure.70 is

a) 1 b) 1+s+$\frac{1}{s}$ c) 2+s+$\frac{1}{s}$ d) $\frac{s^2+s+1}{s^2+2s+1}$

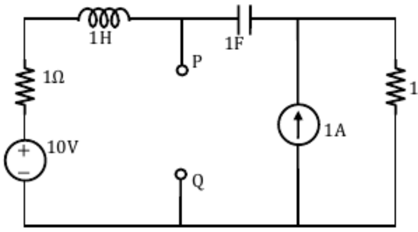

Fig. 70

79) The driving point impedance of the following figure.71 is given by Z(s)=$\frac{0.2s}{s^2+0.1s+2}$.The component values are

a) L=5H, R=0.5Ω, C=0.1F

b) L=0.1H, R=0.5Ω, C=5F

c) L=0.1H, R=2Ω, C=0.1F

d) L=0.1H, R=2Ω, C=5F

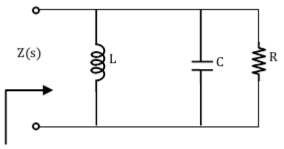

Fig. 71

80) The circuit shown in the figure.72 is used to charge the capacitor C alternately from two current sources as indicated. The switches S1 and S2 are mechanically coupled and connected as follows

a) For 2nT≤t<(2n+1)T ;(n=0,1,2..)S1 to P1 and S2 to P2

b) For (2n+1)T≤t<(2n+2)T, (n=0,1,2....)S1 to Q1 and S2 to Q2 Assume that the capacitor has zero initial charge.Given that u(t) is a unit step function,the voltage$V_c(t)$ across the capacitor is given by

(A) $\Sigma_{n=0}^{\infty}(-1)^n tu(t-nT)$

(B) u(t) + 2 $\Sigma_{n=1}^{\infty}(-1)^n u(t-nT)$

(C) tu(t) + 2 $\Sigma_{n=1}^{\infty}(-1)^n (t-nT)u(t-nT)$

(D) $\Sigma_{n=0}^{\infty}[0.5 \quad - \quad e^{-}(t-2nt) \quad + \; 0.5e^{-}(t-2nT-T)]$

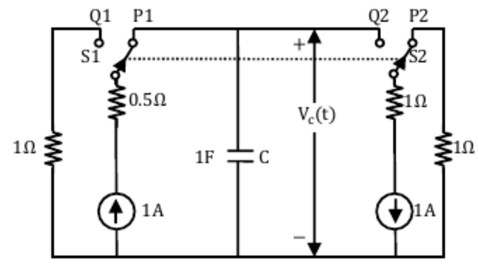

Fig. 72

81) For t>0,the output voltage V_c(t) is

a) $\frac{2}{\sqrt{3}}(e^{-\frac{1}{2}}t - e^{\frac{-\sqrt{3}}{2}}$t)

b) $\frac{2}{\sqrt{3}}te^{-\frac{1}{2}}$t

c) $\frac{2}{\sqrt{3}}e^{-\frac{1}{2}}tcos(\frac{\sqrt{3}}{2}t)$

d) $\frac{2}{\sqrt{3}}e^{-\frac{t}{2}}sin(\frac{\sqrt{3}}{2}t)$

82) For t>0, the voltage across the resistor is

a) $\frac{1}{\sqrt{3}}(e^{\frac{-\sqrt{3}}{2}t}-e^{-\frac{1}{2}t})$

b) e$\frac{-1}{2}t[cos(\frac{\sqrt{3t}}{2})-\frac{1}{\sqrt{3}}sin(\frac{\sqrt{3t}}{2})]$

c) $\frac{2}{\sqrt{3}}e^{-}\frac{1}{2}tsin(\frac{\sqrt{3t}}{2})$

d) $\frac{2}{\sqrt{3}}e^{-}\frac{1}{2}tcos(\frac{\sqrt{3t}}{2})$

83) If the transfer function of the following figure.73 is $\frac{V_0(s)}{V_1(s)}$=$\frac{1}{2+s^{CR}}$ the value of the load resistance R_L is

a) $\frac{R}{4}$

b) $\frac{R}{2}$

c) R

d) 2R

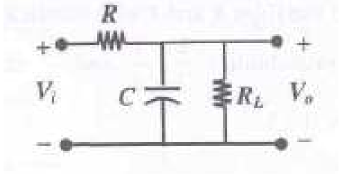

Fig. 73

84) The switch in the figure.74 shown was on position a for a long time and is moved to position b at time t=0 .The current i(t) for t> 0 is given by

a) 0.2e^{-125t}u(t) mA

b) 20e^{-1250t}u(t) mA

c) 0.2e^{-1250t}u(t) mA

d) 20e^{-1000t}u(t) mA

85) In the figure.75 shown ,what value of R_L maximizes the power delivered to R_L ?

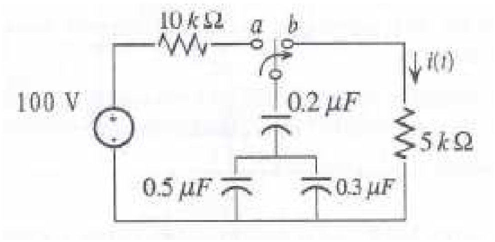

Fig. 74

a) 2.4Ω

b) $\frac{8}{3}$Ω

c) 4Ω

d) 6Ω

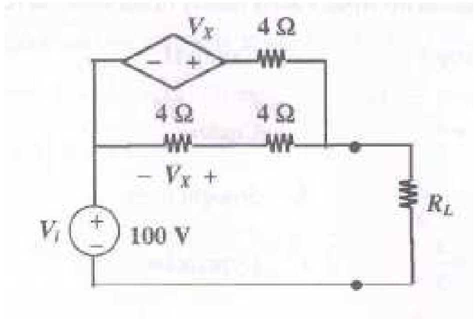

Fig. 75

86) The time domain behaviour of an RL circuit is represented by
L$\frac{d_i}{d_t}$+ R_i = $V_0(1+Be^{-\frac{R_t}{L}}sint)$ u(t).
For an initial current of i(0)=$\frac{V_0}{R}$,the steady state value of the current is given by

a) i(t)→ $\frac{V_0}{R}$

b) i(t)→ $\frac{2V_0}{R}$

c) i(t)→ $\frac{V_0}{R}$(1+B)

d) i(t)→ $\frac{2V_0}{R}$(1+B)

87) For parallel RLC circuit, which one of the following statements is NOT correct?

a) The bandwidth of the circuit decreases if R is increased.

b) The bandwidth of the circuit remains same if L is increased.

c) At resonance, input impedance is a real quantity.

d) At resonance, the magnitude of input impedance attains its minimum value.

88) In the figure.76 shown, the switch S is open for a long time and is closed at t=0. The current i(t) for t$\geq 0^+$ is

a) i(t)=$0.5 - 0.125e^{-1000t}$A

b) i(t)=$1.5 - 0.125e^{-1000t}$A.

c) i(t)=$0.5 - 0.5e^{-1000t}$A

d) i(t)=$0.375e^{-1000t}$A

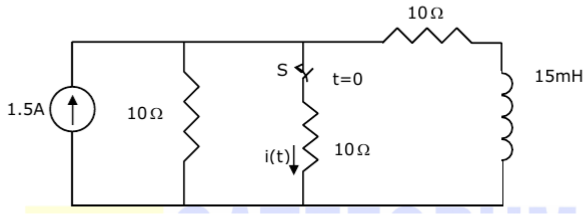

Fig. 76

89) The current I in the figure.77 shown is

a) -j1A b) J1A c) 0A d) 20A

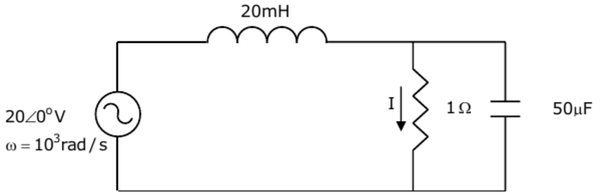

Fig. 77

90) In the figure.78shown,the power supplied by the voltage source is

a) 0W

b) 5W

c) 10w

d) 100w

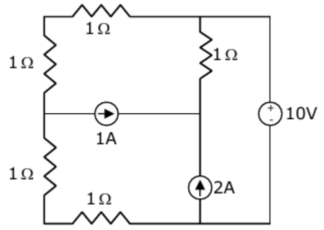

Fig. 78

91) The figure.79 shown below is driven by a sinusoidal input $V_i = V_p cos(\frac{t}{RC})$ .The steady state output V_0 is

a) $(\frac{V_p}{3})cos(\frac{t}{RC})$

b) $(\frac{V_p}{3})sin(\frac{t}{RC})$

c) $(\frac{V_p}{2})cos(\frac{t}{RC})$

d) $(\frac{V_p}{2})sin(\frac{t}{RC})$

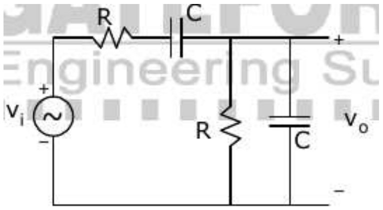

Fig. 79

92) In the figure.80 shown below, the Norton equivalent current in amperes with respect to the terminals P and Q is

a) 6.4-j4.8

b) 6.56-j7.87

c) 10+j0

d) 16+j0

93) In the figure.81shown below, the value of R_L such that the power transferred to R_L is maximum

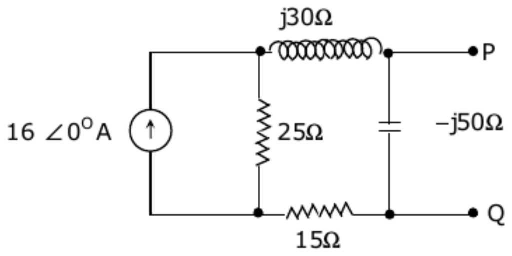

Fig. 80

a) 5Ω

b) 10Ω

c) 15Ω

d) 20Ω

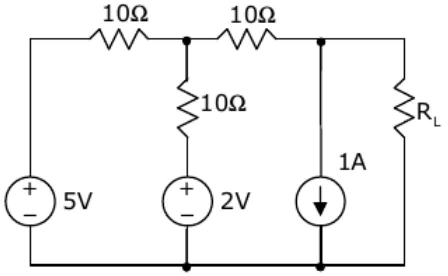

Fig. 81

94) In the figure.82 shown below, the current I is equal to

a) 14∠0°A

b) 2.0∠0°A

c) 2.8∠0°A

d) 3.2∠0°A

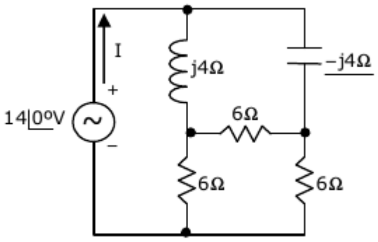

Fig. 82

95) In the figure.83 shown below, the initial charge on the capacitor is 2.5 mC, with the voltage polarity as indicated. The switch is closed at time t=0. The current i(t) at a time t after the switch is closed is

a) i(t)=15exp(-2×10^3t)A

b) i(t)=5exp(-2×10^3t)A

c) i(t)=10exp(-2×10^3t)A

d) i(t)=-5exp(-2×10^3t)A

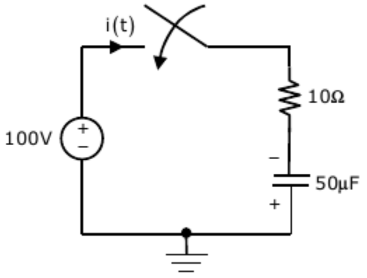

Fig. 83

96) In the figure.84 shown below,the current through the inductor is

a) $\frac{2}{1+j}$A

b) $\frac{-1}{1+j}$A

c) $\frac{1}{1+j}$A

d) 0A

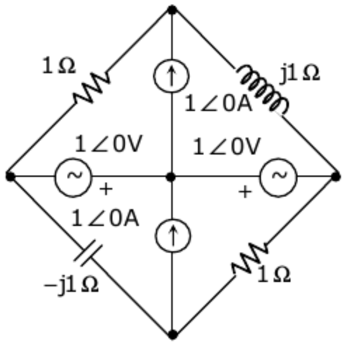

Fig. 84

97) The impedance looking into nodes 1 and 2 in the given figure.85 is

a) 50Ω b) 100Ω c) 5KΩ d) 10.1kΩ

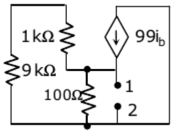

Fig. 85

98) In the following figure C_1 andC_2 are ideal capacitors.C_1 has been charged to 12V before the ideal switch S is closed at t=0.The figure.86 i(t) for all t is

a) zero

b) a step function

c) an exponentially decaying function

d) an impulse function

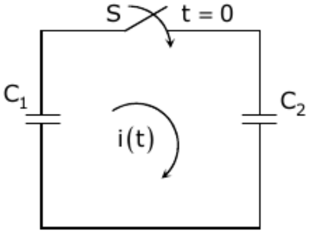

Fig. 86

99) If V_A - V_B=6V,then V_C - V_D is, figure.87

a) -5V b) 2V c) 3V d) 6V

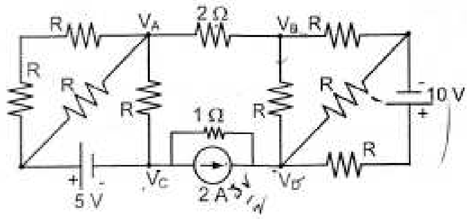

Fig. 87

100) Assuming both the voltages sources are in phase,the value of R for which maximum power is transfered from circuit A to circuit B is,figure.88

a) 0.8Ω

b) 1.4Ω

c) 2Ω

d) 2.8Ω

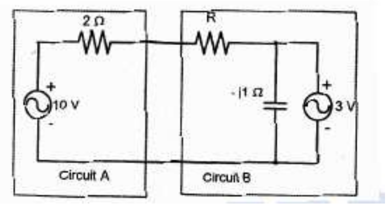

Fig. 88

101) The transfer function $\frac{V_2(s)}{V_1(s)}$ of the figure.89shown below is

a) $\frac{0.5s+1}{s+1}$

b) $\frac{3s+6}{s+2}$

c) $\frac{s+2}{s+1}$

d) $\frac{s+1}{s+2}$

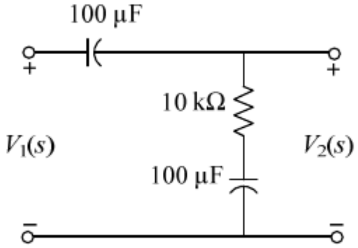

Fig. 89

102) In the circuit shown below, if the source voltage V_s= 100 ∠ 53.13°V then the Thevenin's equivalent voltage in Volts as seen by the load resistance R^L is

a) 100∠90°

b) 800∠0°

c) 800∠90°

d) 100∠60°

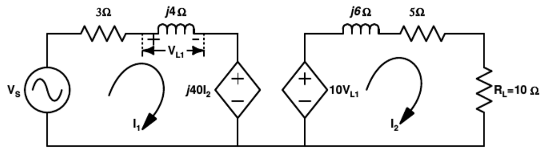

Fig. 90

103) Consider the following figure.91 for question (a) and (b).

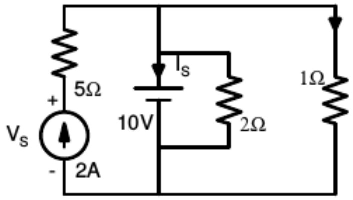

Fig. 91

a) The current I_s in Amps in the voltage source, and voltage V_s in Volts across the current source respectively, are

i) 13,-20

ii) 8,-10

iii) -8,20

iv) -13,20

b) The current in the 1Ω resistor in Amps is,

i) 2 ii) 3.33 iii) 10 iv) 12

104) Find the current I in the following Branch.,figure.92

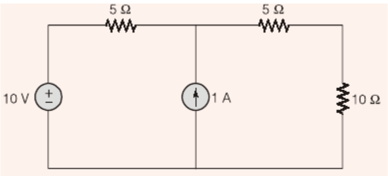

Fig. 92

105) A series R_c figure.93 is connected to DC voltage source at time t_0=0.The relation between the source voltage V_s,the resistance R,the capacitance C,the current i(t) is below:

V_s= $R_i(t)$ + $\frac{1}{C}\int_0^t$i(t)dt.

Which one of the following i(t) represents

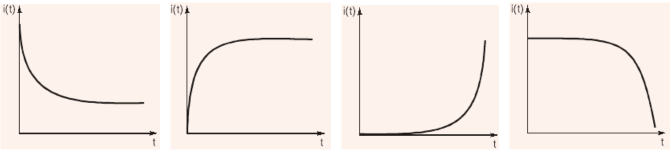

Fig. 93

106) Find the resistance R_1 from y figure.94

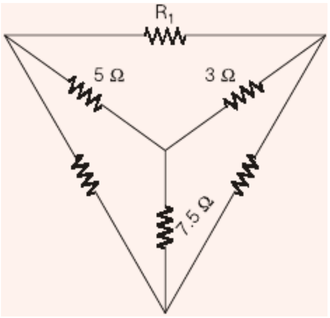

Fig. 94

107) Find the V_0,figure.95

a) $\frac{5}{2}V_1$-3V_2

b) 2V_1-$\frac{5}{2}V_2$

c) $\frac{-3}{2}V_1$-$\frac{7}{2}V_2$

d) -3$V_1 + \frac{11}{2}V_2$

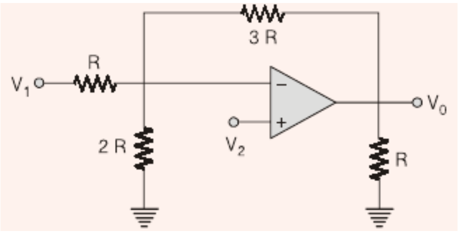

Fig. 95

108) For the figure.96 given below, what will be the largest value of arm when it is converted into delta form.

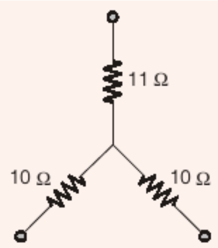

Fig. 96

109) For the given figure.97, the value of capacitor is in mF. So that the system will be critically damped is

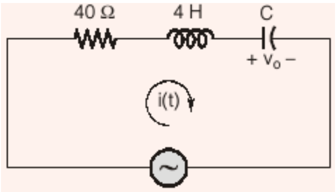

Fig. 97

110) Where R=1Ω,i_1 = 2A, i_4 = –1A, i_5 = –4A. Then which of the following is correct,figure.98

a) i_6=5A

b) i_3=-4A

c) Given data sufficient to tell these currents are not possible

d) Data is not sufficeint to find i_2,i_3,i_6

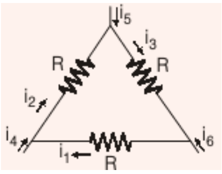

Fig. 98

111) In the figure.99 shown,at resonance,the amplitude of the sinusoidal voltage(in Volts) across the capacitor is

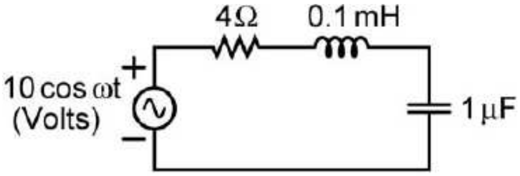

Fig. 99

112) In the network shown in the figure.100, all resistors are identical with R=300Ω. The resistance R_{ab} (in Ω) of the network is

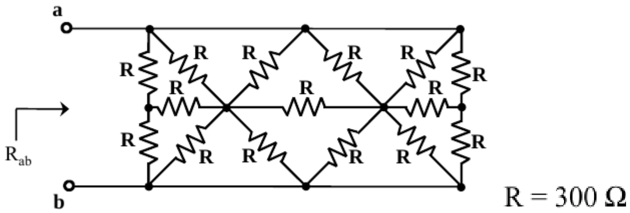

Fig. 100

113) In the given figure.101, the values of V_1 and V_2 respectively are

a) 5V,25V

b) 10V,30V

c) 15V,35V

d) 0V,20V

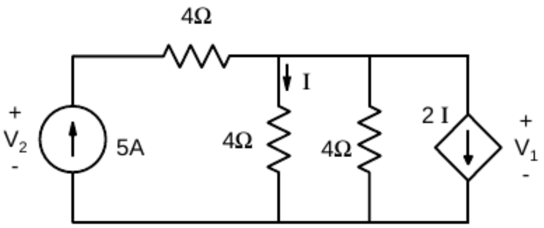

Fig. 101

114) In the figure.102 shown, the switch SW is thrown from positionA to positionB at time t=0. The energy (in μJ) taken from the 3V source to charge the 0.1 μF capacitor from 0V to 3V is

a) 0.3 b) 0.45 c) 0.9 d) 3

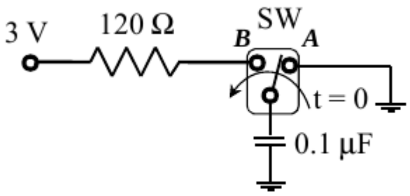

Fig. 102

115) The damping ratio of a series RLC circuit can be expressed as

a) $\frac{R^2C}{2L}$

b) $\frac{2L}{R^2C}$

c) $\frac{R}{2}\sqrt{\frac{C}{L}}$

d) $\frac{2}{R}\sqrt{\frac{L}{C}}$

116) In the figure.103 shown, switch SW is closed at t=0. Assuming zero initial conditions, the value of V_c(t)(in Volts) at t=1 sec is

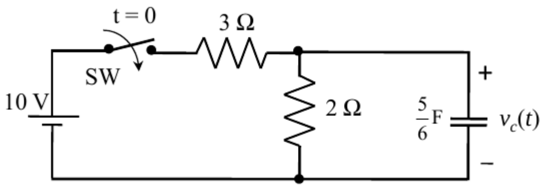

Fig. 103

117) In the given figure.104, the maximum power (in Watts) that can be transferred to the load R_L is

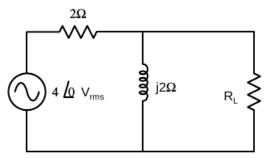

Fig. 104

118) The Venn diagram.105 shows the preference of the student population for leisure activities.From the data given,the number of students who like to read books or play sports is

a) 44 b) 51 c) 79 d) 108

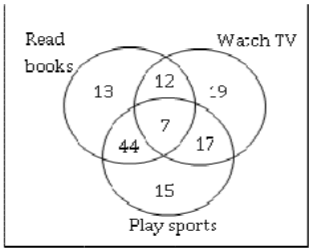

Fig. 105

119) Social science disciplines were in existence in an amorphous form until the colonial period when they were institutionalized. In varying degrees, they were intended to further the colonial interest.In the time of globalization and the economic rise of postcolonial countries like India,conventional ways of knowledge production have become obsolete.

Which of the following can be logically inferred from the above statements?

(i) Social science disciplines have become obsolete.

(ii) Social science disciplines had a pre-colonial origin.

(iii) Social science disciplines always promote colonialism.

(iv) Social science must maintain disciplinary boundaries.

A (ii)only

B (i) and (iii) only

C (ii) and (iv) only

D (iii) and (iv) only

120) Two and a quarter hours back, when seen in a mirror, the reflection of a wall clock without number markings seemed to show 1:30.What is the actual current time shown by the clock?

a) 8:15 b) 11:15 c) 12:15 d) 12:45

121) In the given circuit.106, each resistor has a value equal to 1Ω What is the equivalent resistance across the terminals a and b?

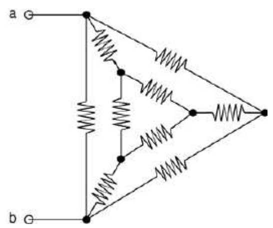

Fig. 106

a) $\frac{1}{6}\Omega$ b) $\frac{1}{3}\Omega$ c) $\frac{9}{20}\Omega$ d) $\frac{8}{15}\Omega$

122) In the circuit shown in the figure.107, the magnitude of the current (in amperes) through R_2 is

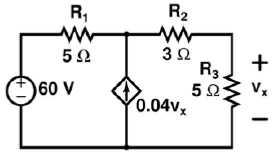

Fig. 107

123) In the circuit.108 shown,V is a sinusoidal voltage source.The current I is in phase with voltage V.
The ratio $\frac{amplitude\ of\ voltage\ across\ the\ capacitor}{amplitude\ of\ voltage\ across\ the\ resistor}$ is

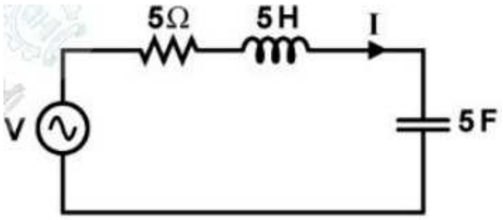

Fig. 108

124) The switch in the circuit.109 shown in the figure was open for a long time and is closed at t=0.The current i(t) (in ampere) at t=0.5 seconds

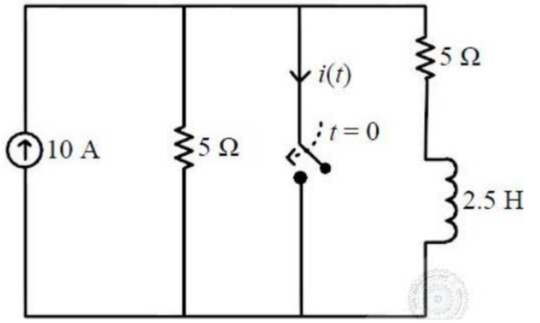

Fig. 109

125) Consider the circuit shown in the figure.110. The Thevenin equivalent resistance (inΩ)across P-Q is

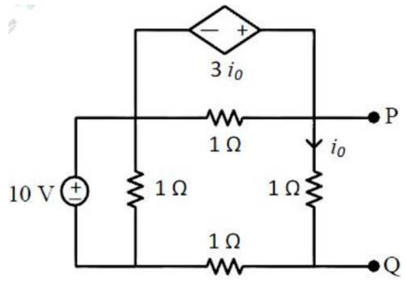

Fig. 110