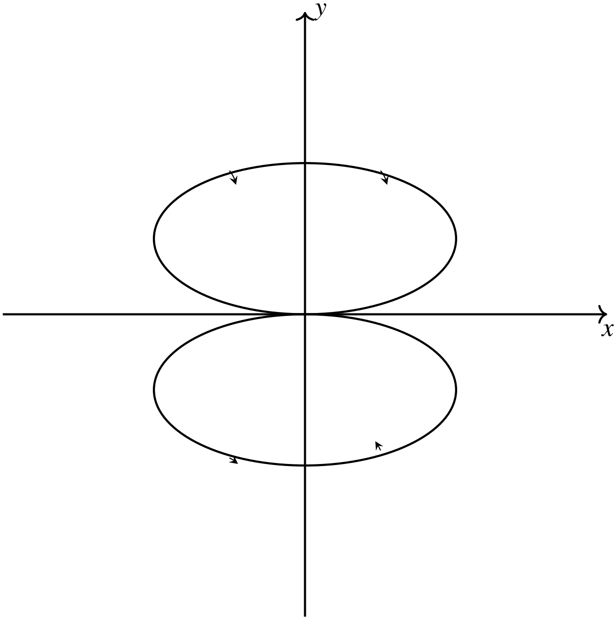
2008-EE- 69-88

AI24BTECH11018 - Sreya

69) Two sinusoidal signals $p(w_1t) = A$ and $q(w_2t)$ are applied to X and Y inputs of a dual channel.CRO. The Lissajous figure displayed on the screen is shown below :



The signal $q(w_2t)$ will be represted as

a) $q(w_2t) = A\sin w_2t,\ w_2 = 2w_1$
b) $q(w_2t) = A\sin w_2t\ ,\ w_2 = \frac{w_1}{2}$
c) $q(w_2t) = A\cos w_2t,\ w_2 = 2w_1$
d) $q(w_2t) = A\cos w_2t = A\cos w_2t\ , w_2 = \frac{w_1}{2}$

70) The ac bridge shown in the figure is used to measure the impendence Z

a) $(260 + j0)\Omega$
b) $(0 + j200)\Omega$
c) $(260 - j200)\Omega$
d) $(260 + j200)\Omega$

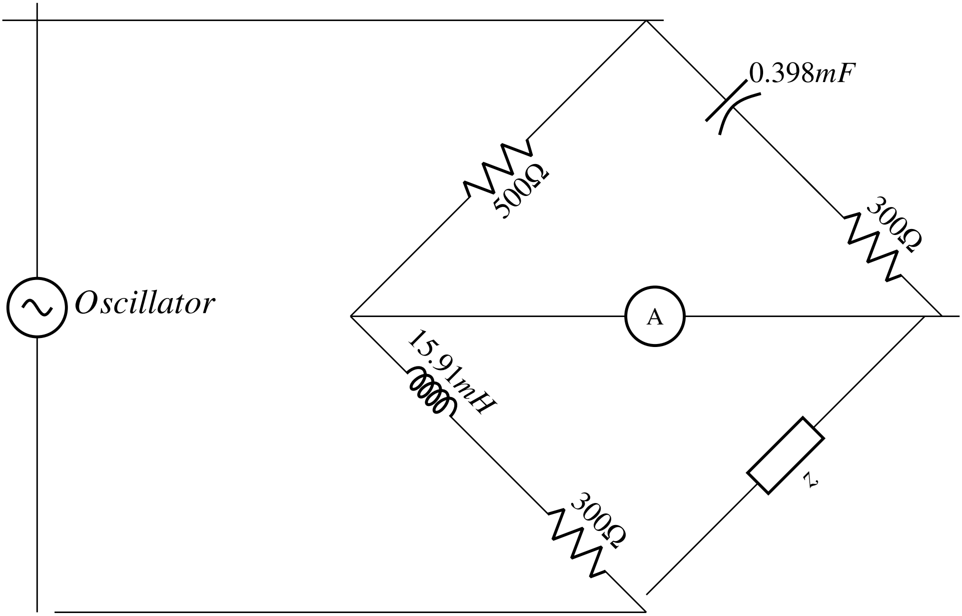
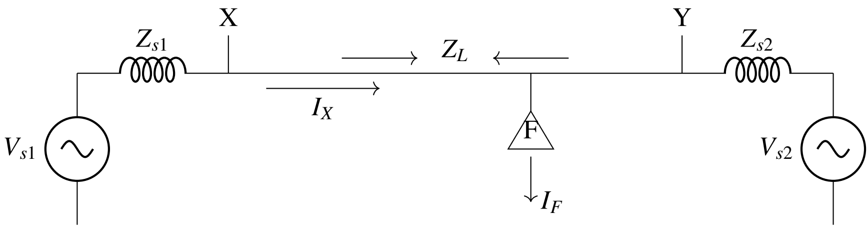


Fig. 70: Circuit diagram with sinusoidal voltage source

Common Data Questions

Common Data for Questions 71**,** 72 **and** 73**:**

Consider a power system shown below:



given that :

$Vs1 = Vs2 = 1.0 + j0.0pu$:

The positive sequence impendances $Z_{s1} = Z_{s2} = 0.001 + j0.001pu$ and $Z_L = 0.006 + j0.06pu$.

3-phase Base $MVA = 100$

Voltage $base = 400kV$ $(LinetoLine)$

Nominal system $frequency = 50Hz$

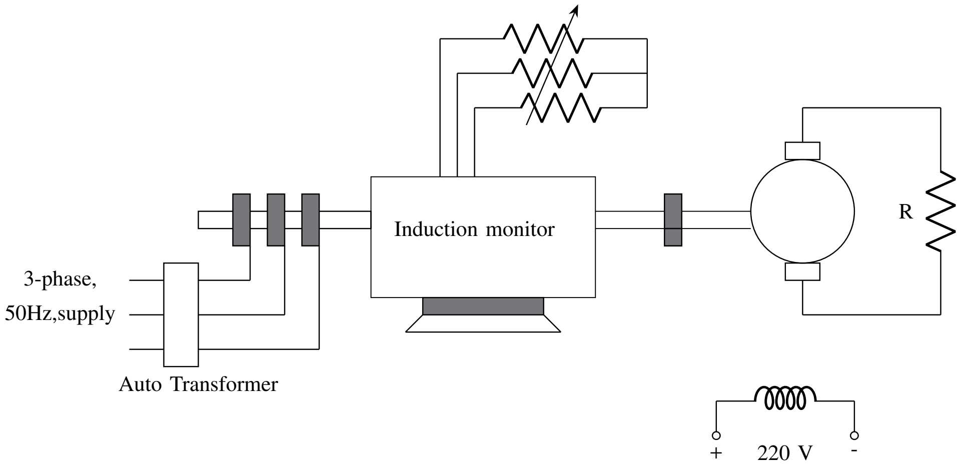
reference voltage for phase $'a'$ is defined as $v(t) = V_m \cos(\omega t)$
symmetrical three phase fault occurs at centre of the line, i.e. point $'F$ at time to. The positive sequence impedance from source S_1, to point F equals $0.004 + j0.04pu$. The waveform corresponding to phase a fault current from bus X reveals that decaying de offset current is negative and in magnitude at its maximum initial value. Assume that the negative sequence impedances are equal to positive sequence impedances, and the zero sequence impedances are three times positive sequence impedances.

71) The instant (t_0) of the fault will be
   a) $4.682ms$
   b) $9.667ms$
   c) $14.667ms$
   d) $19.667ms$
72) The rms value of the component of fault current I_X will be
   a) $3.59kA$
   b) $5.07kA$
   c) $7.18kA$
   d) $10.15kA$
73) Instead of the three phase fault, if a single line to ground fault occurs on phase $'a'$ at point F with zero fault impedance, then the rms value of the ac component of fault current (I_x) for phase $'a'$ will be
   a) $4.97pu$
   b) $7.0pu$
   c) $14.93pu$
   d) $29.85pu$

Common Data for 74 and 75:

$3-phase$, $440V$, $50Hz$, $4-pole$, slip ring induction motor is fed from the rotor side through an auto- transformer and the stator is connected to a variable resistance as shown in the figure.

The motor is coupled to a $220V$, separately excited, dc generator feeding power to fixed resistance of 10Ω. Two-wattmeter method is used to measure the input power to induction motor. The variable resistance is adjusted such that the motor runs at

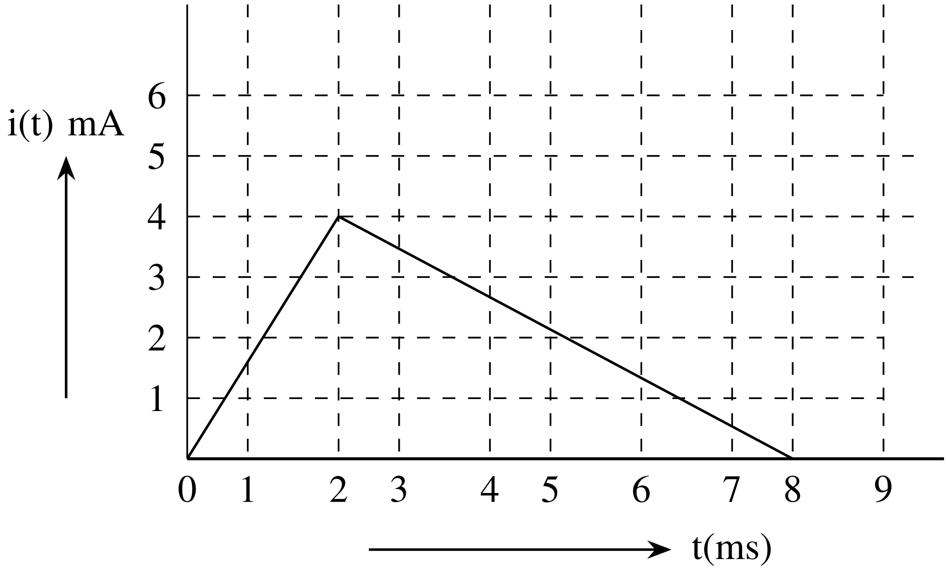


1410rpm and the following readings were recorded:
$w_1 = 1800w$, $w_2 = -200w$

74) The speed of rotation of stator feild with respectect to the structure will be
   a) 90rpm in the direction of rotation
   b) 90rpmin the opposite directios of rotation
   c) 1500rpm in the direction of rotation
   d) 1500rpm the opposite directios of rotation
75) Neglecting all losses of both the machines, the de generator power output and the current through resistance R_{ex} will respectively be
   a) 96W,3.10A
   b) 120W, 3.46A
   c) 1504W,12.26A
   d) 1880W,13.71A

Linked Answers: Q.76 to Q85 carry two marks each
Statement linked Answer Questions 76 and 77:
The current $i(t)$ sketched in the figure through an intially uncharged 0.3nF capacitor.

76) The charge stored in the capacitor at $t = 5\mu s$ will be
   a) 8nC
   b) 10nC
   c) 13nC
   d) 16nC
77) The capacitor charged upto 5μs, as per the current profile given in the figure, is connected across an inductor of 0.6mH. Then the value of voltage across the capacitor after 1μs will approximately be
   a) 18.8V



b) $23.5V$
c) $-23.5V$
d) $-30.6V$

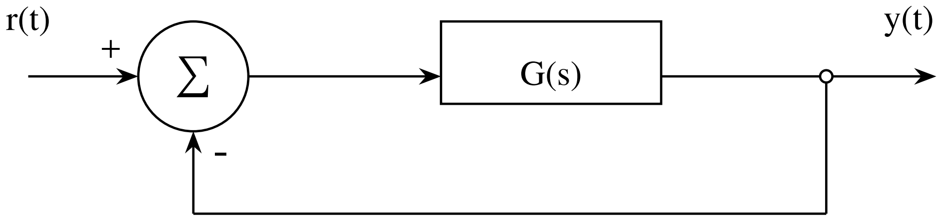
Statement linked with Answer Questions 78 and 79:
The state space equation of a system described by
$x = Ax + Bu$
$y = Cx$
where x is a vector, u is input, y is output and $\begin{pmatrix} 0 & 1 \\ 0 & -2 \end{pmatrix} \begin{pmatrix} 0 \\ 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \end{pmatrix}$.

78) The transfer function $G(s)$ of this system will be
a) $\frac{s}{(s+2)}$
b) $\frac{s+1}{s(s-2)}$
c) $\frac{s}{(s-2)}$
d) $\frac{1}{s(s+2)}$

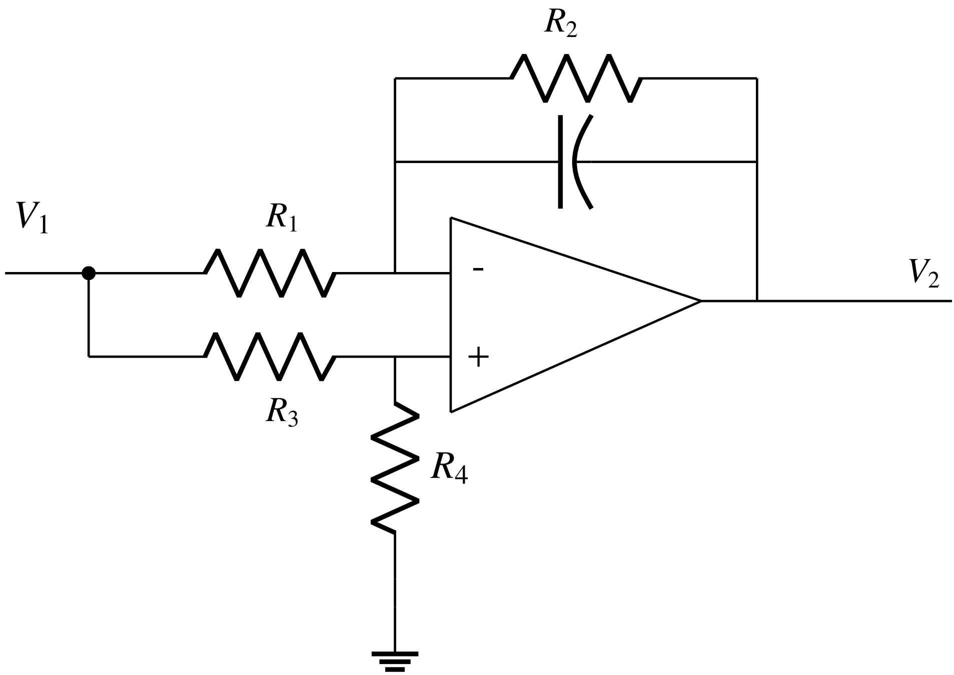
79) A unity feedback is provided to the above system $G(s)$ to make it a closed loop as shown in figure.

For a unit step $r(t)$, the stedy state error in the output will be
a) 0
b) 1
c) 2
d) ∞

Statemet for Linked Answer Questions 80 and 81:



A general filter circuit is shown in the figure:

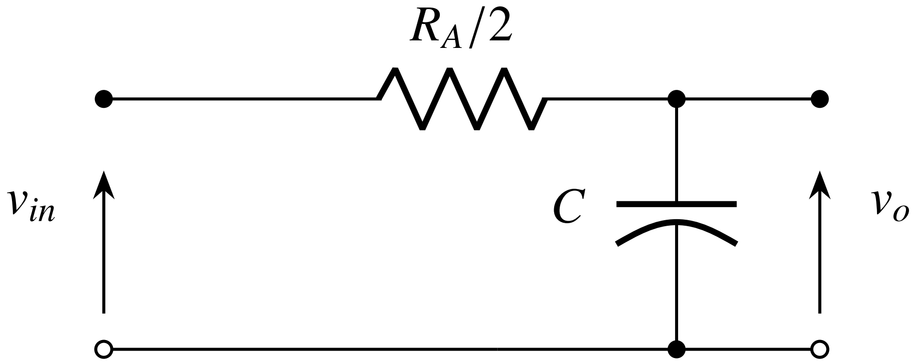


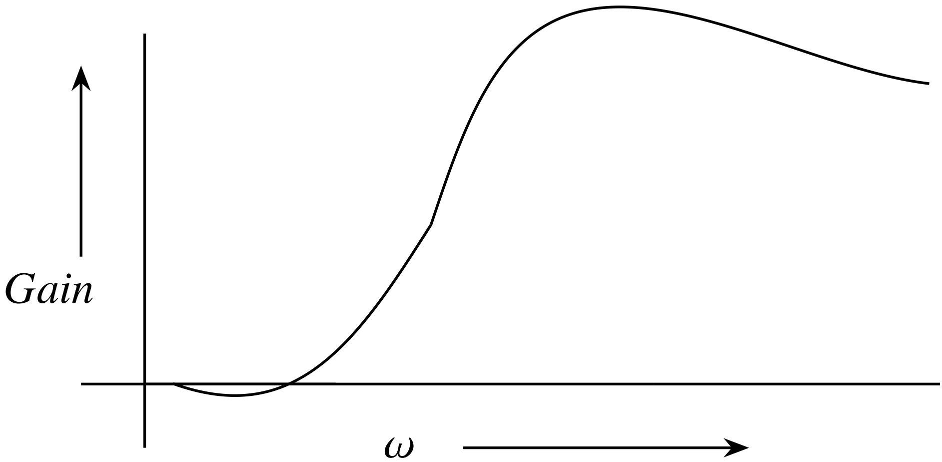
80) if $R_1 = R_2 = R_A$ and $R_3 = R_4 = R_B$, the circuit acts as a

a) all pass filter
b) hand pass filter
c) high pass filter
d) low pass filter

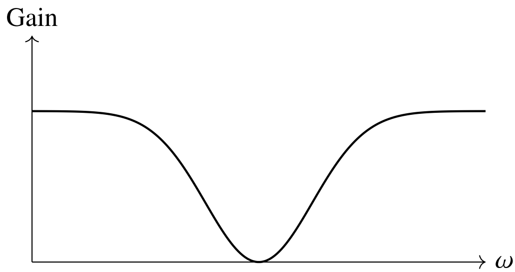
81) The output of the filter in Q.80 is given to the circuit shown in the figure: The gain vs frequency characteristic of the uotput (v_o) will be

a)

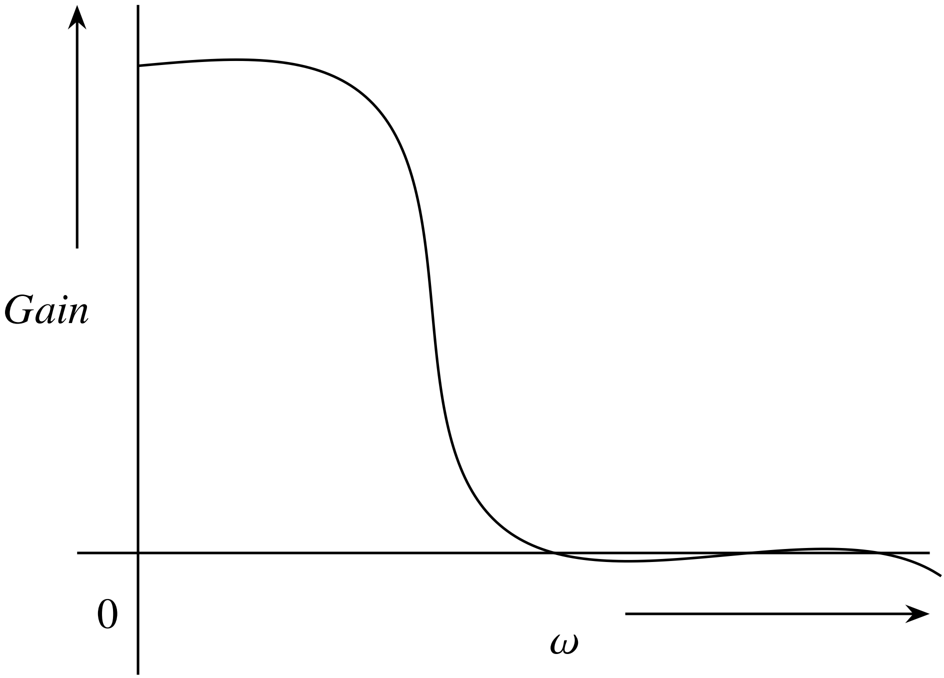


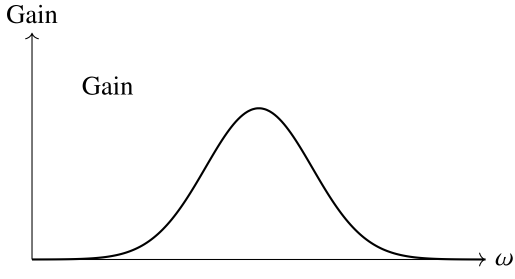


b)



c)



d) 

Statement Linked Answer Questions 82 and 83:
A 240v dc shunt motr draws 15A while supplying the rated load at a speed of 80 $\frac{rad}{s}$. The armature resistance is 0.5Ω and the feild winding resistance is 80Ω.

82) The net voltage across the armature at the plugging will be
   a) $6V$
   b) $234V$
   c) $240V$
   d) $474V$
83) The capacitor charged upto 5 us, as per the current profile given in the figure, is connected across an inductor of $0.6mH$. Then the value of voltage across the capacitor after 1 us will approximately be

a) 31.1Ω
b) 31.9Ω
c) 15.1Ω
d) 15.9Ω

84) A synchronous motor is connected to an infinite bus at $1.0pu$ voltage and draws $0.6pu$ current at unity power factor. Its synchronous reactance is $1.0pu$ and resistance is negligible.

a) $0.8pu$ and 36.86^o lag
b) $0.8pu$ and 36.86^o lead
c) $1.17pu$ and 30.96^o lead
d) $1.17pu$ and 30.96^o lag

85) Keeping the excitation voltage same, the load on the motor is increased such that the motor current increases by 20 percent. The operating power factor will become

a) 0.995 lagging
b) 0.995 leading
c) 0.791 lagging
d) 0.848 leading