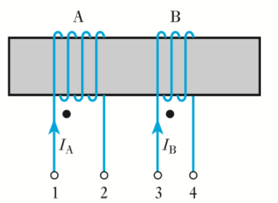
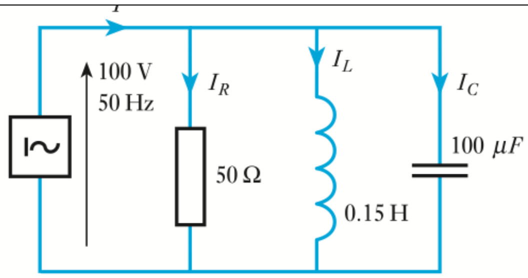
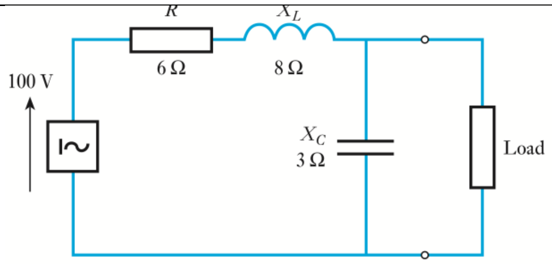
10 QUESTIONS LOG ANA- REASONING AND 20 Q ON ENGG MATH. PRINTED
1-30.
THEN SERIAL 31-90 THESE BRANCH QUESTIONS.

60 Q OF EE FOR MTECH ENTRANCE

Q.1	If two capacitors having capacitances of 6 μF and 10 μF respectively are connected in series across a 200 V supply, the voltage across the smaller capacitor is:	
	A	75 V
	B	0
	C	200 V
	D	125 V
Q.2	A coil of 200 turns is wound uniformly over a wooden ring having a mean circumference of 600 mm and a uniform cross-sectional area of 500 mm2. If the current through the coil is 4.0 A, the flux density is:	
	A	1680 μT
	B	0.838 μT
	C	1330 μT
	D	1680 T
Q.3	A coil of 300 turns, wound on a core of non-magnetic material, has an inductance of 10 mH. The average value of the e.m.f. induced when a current of 5 A is reversed in 8 ms (milliseconds) is:	
	A	1250 V
	B	167 V
	C	12.5 V
	D	41.7 mV
Q.4	 The total energy stored in the magnetic field can be given by the expression	
	A	$\frac{1}{2}L_A I_A^2 + \frac{1}{2}L_B I_B^2 - \frac{1}{2}M_{AB} I_A I_B$
	B	$\frac{1}{2}L_A I_A^2 + \frac{1}{2}L_B I_B^2 + M_{AB} I_A I_B$
	C	$\frac{1}{2}L_A I_A^2 + \frac{1}{2}L_B I_B^2 - M_{AB} I_A I_B$
	D	$\frac{1}{2}L_A I_A^2 + \frac{1}{2}L_B I_B^2 + \frac{1}{2}M_{AB} I_A I_B$

Q. 5	 In the circuit shown the supply power factor is	
	A	0.893 leading
	B	0.893 lagging
	C	-0.893
	D	26 degree
Q.6	An inductor coil is connected in series with a pure resistor of 30 Ω across a 230 V, 50 Hz supply. The voltage measured across the coil is 180 V and the voltage measured across the resistor is 130 V. The power dissipated in the coil is:	
	A	50 W
	B	70 W
	C	100 W
	D	60 W
Q.7	An a.c. generator is supplying a load of 300 kW at a power factor of 0.6 lagging. If the power factor is raised to unity, how much more power (in kilowatts) can the generator supply for the same kilovolt- ampere loading?	
	A	500 kW
	B	300 kW
	C	200 kW
	D	0 kW
Q.8	A coil of resistance 12 Ω and inductance 0.12 H is connected in parallel with a 60μF capacitor to a 100 V variable-frequency supply. The frequency at which the circuit will behave as a non-reactive resistor is:	
	A	0
	B	50.7
	C	57.2 Hz
	D	5kHz

Q.9



Determine the Thévenin voltage for the network supplying the load is :

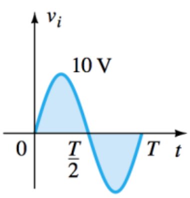
A	100 V
B	50 V
C	(□32.6 □ j19.5) V
D	(□24.6 □ j29.5) V

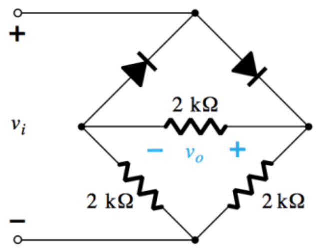
Q.10

A three-phase motor operating off a 400 V system is developing 20 kW at an efficiency of 0.87 p.u. and a power factor of 0.82. The line current is

A	23.1 A
B	20 A
C	40 A
D	26.55 A

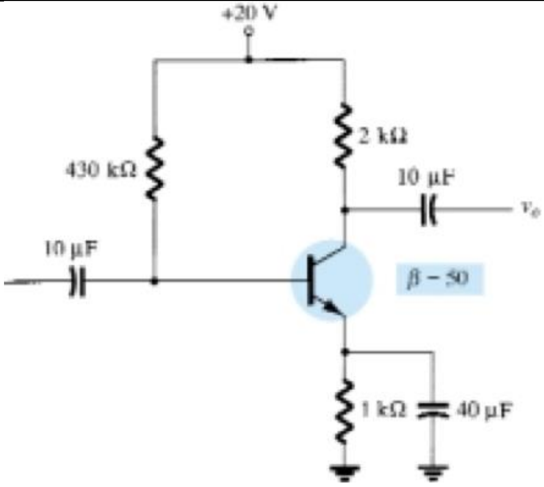
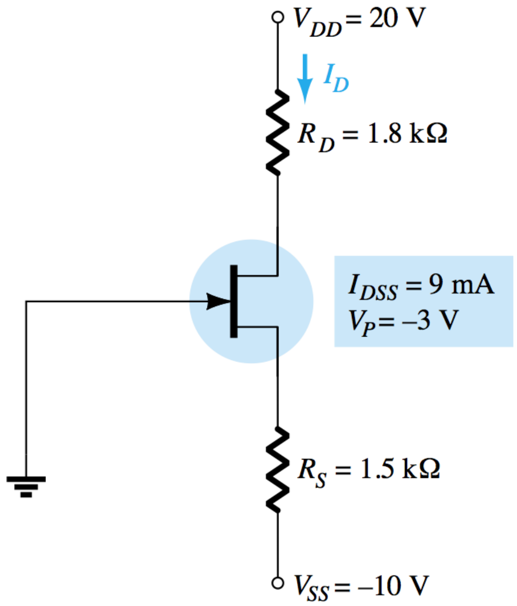
Q.11

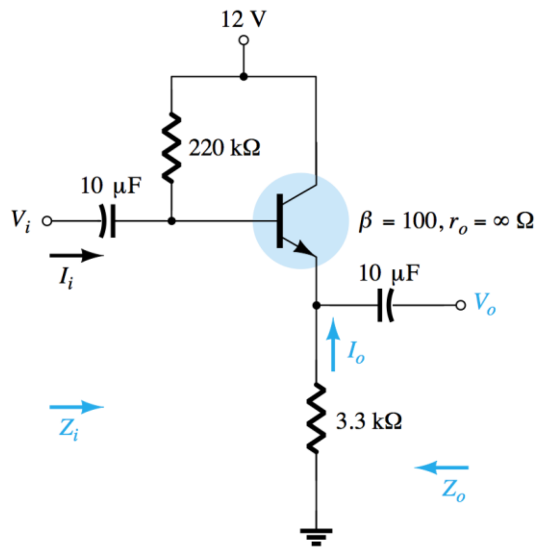
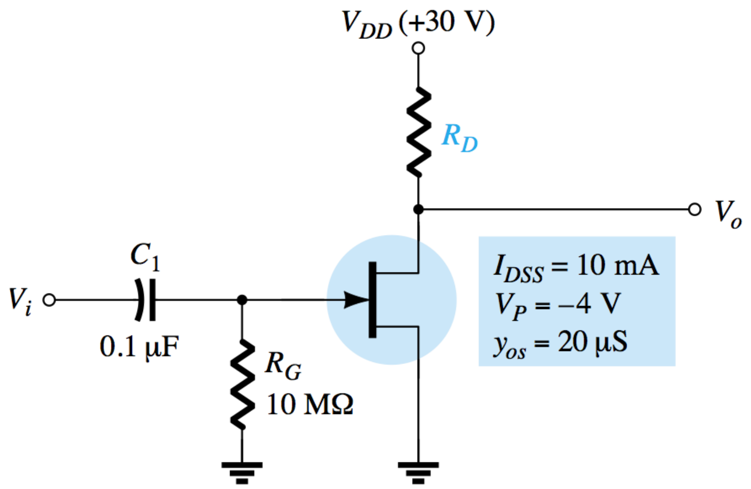


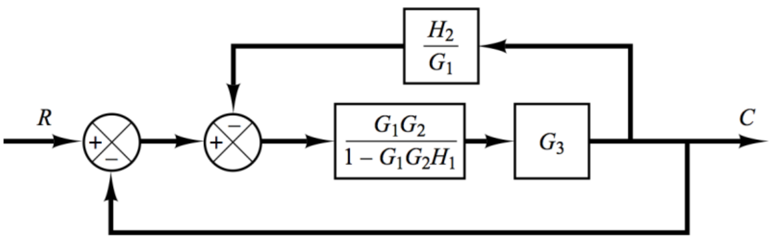


The Peak Inverse Voltage of each diode is :

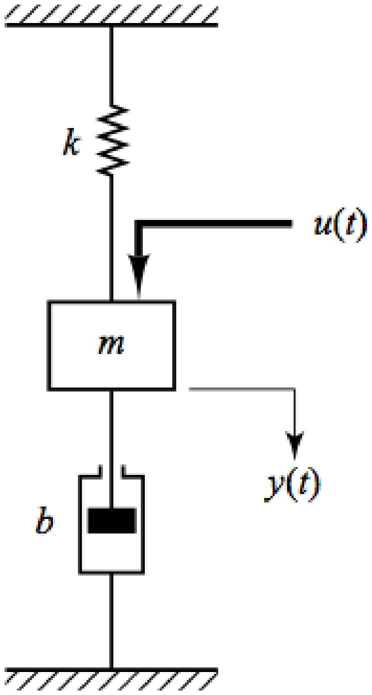
A	10 V
B	5 V
C	20 V
D	7.07 V

Q.12	 The value of I_C is approximarely:	
	A	2 mA
	B	3 mA
	C	40 micro A
	D	50 micro A
Q.13	 The value of V_{DS} is :	
	A	10 V
	B	3 V
	C	-0.35 V
	D	7.23 V
Q.14	The transistor configuration having minimum output impedance is:	
	A	Common Emitter
	B	Common Base
	C	Common Collector
	D	Inverse Common Emitter

Q.15	 The input impedance for the circuit approximately is :	
	A	133 kΩ
	B	12. 5 kΩ
	C	296 kΩ
	D	12.6 Ω
Q.16	 The required value of R_D to achieve an AC gain of 10 is approximately:	
	A	50 kΩ
	B	10 MΩ
	C	2 kΩ
	D	10 kΩ

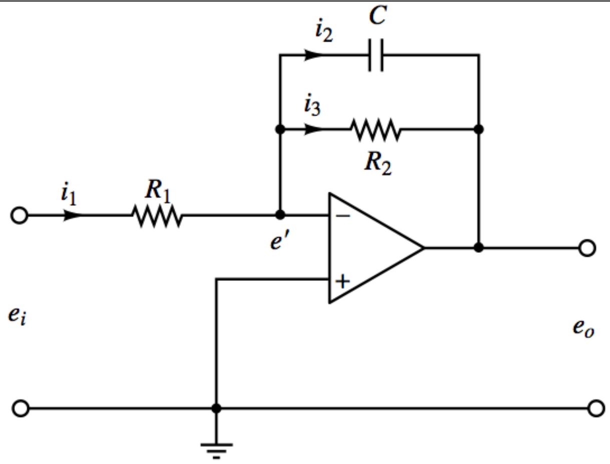
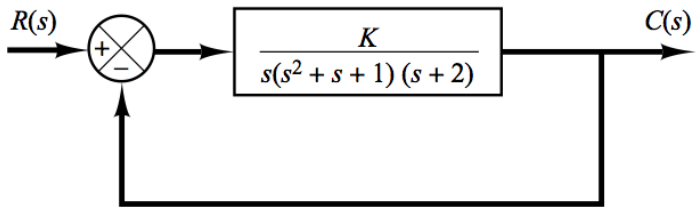
Q.17	Determine the output voltage of an op-amp for input voltages of V_{i1} =150 V, V_{i2} = 140 V. The amplifier has a differential gain of A_d = 4000 and the value of CMRR is 100. The output voltage approximately is:	
	A	40 mV
	B	30 mV
	C	20 mV
	D	46 mV
Q.18	The gain of an amplifier changes from a value of 1000 by 10%. The over all percentage gain change if the amplifier is used in a feedback circuit having a feedback gain of 1/20 is	
	A	0.19
	B	0.29
	C	0.39
	D	0.49
Q.19	 The gain of the system is	
	A	$\frac{G_1G_2G_3}{1+G_1G_2H_1 - G_2G_3H_2 + G_1G_2G_3}$
	B	$\frac{G_1G_2G_3}{1+G_1G_2H_1 + G_2G_3H_2 + G_1G_2G_3}$
	C	$\frac{G_1G_2G_3}{1- G_1G_2H_1 + G_2G_3H_2 + G_1G_2G_3}$
	D	$\frac{G_1G_2G_3}{1- G_1G_2H_1 - G_2G_3H_2 + G_1G_2G_3}$

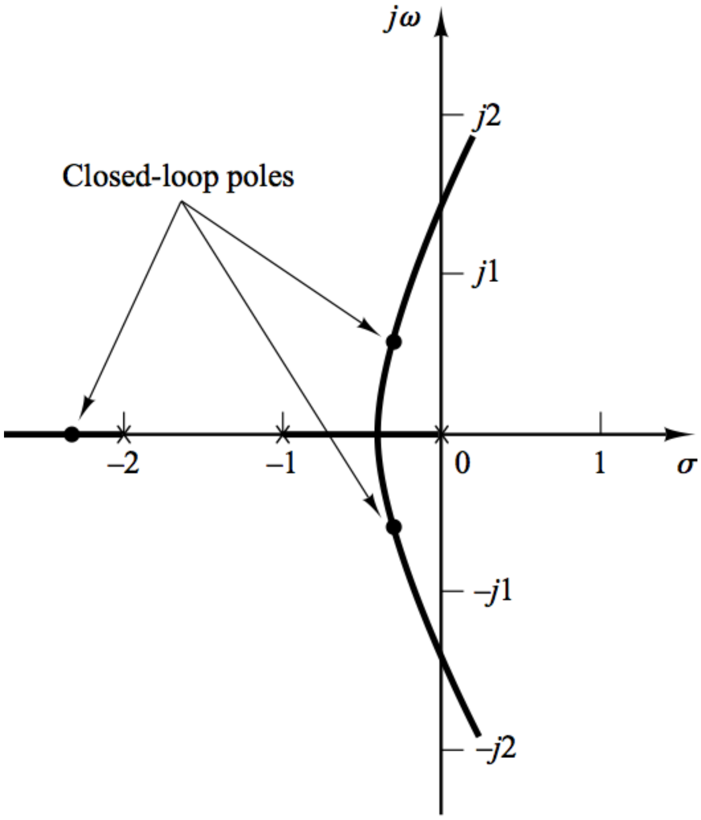
Q.20



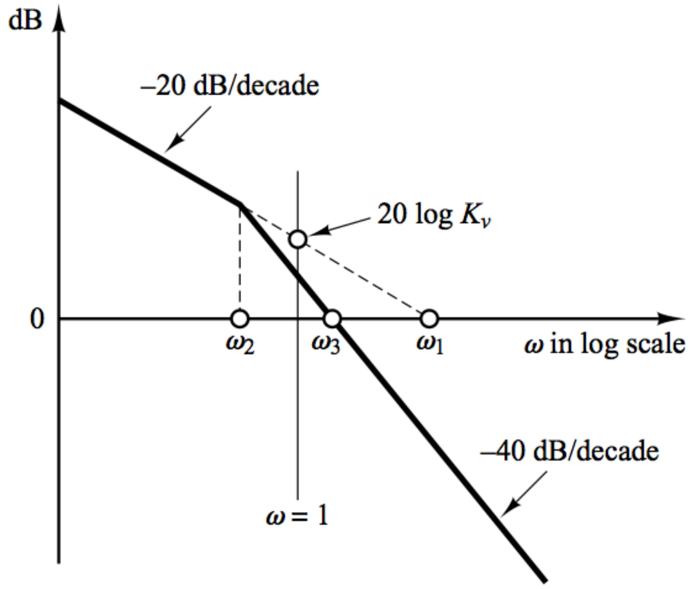
The state space representation of the system is given by

A	$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ \frac{k}{m} & \frac{b}{m} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{m} \end{bmatrix} u$
B	$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -\frac{k}{m} & \frac{b}{m} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{m} \end{bmatrix} u$
C	$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ \frac{k}{m} & -\frac{b}{m} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{m} \end{bmatrix} u$
D	$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -\frac{k}{m} & -\frac{b}{m} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{m} \end{bmatrix} u$

Q.21	 The transfer function of the input-output is	
	A	$\frac{E_0(s)}{E_i(s)} = -\frac{R_1}{R_2}\left(\frac{1}{R_2Cs+1}\right)$
	B	$\frac{E_0(s)}{E_i(s)} = -\frac{R_2}{R_1}\left(\frac{1}{R_2Cs+1}\right)$
	C	$\frac{E_0(s)}{E_i(s)} = -\frac{R_2}{R_1}\left(\frac{1}{R_1Cs+1}\right)$
	D	$\frac{E_0(s)}{E_i(s)} = -\frac{R_2}{R_1}\left(\frac{1}{R_2Cs-1}\right)$
Q.22	 The value of K for which the system is stable is:	
	A	$-\frac{9}{14} < K < 0$
	B	$\frac{9}{14} > K > 0$
	C	$-\frac{14}{9} < K < 0$
	D	$\frac{14}{9} > K > 0$

Q.23		
	 The root locus shown in the figure belongs to a forward transfer function of the form :	
	A	$\dfrac{K}{s(s+1)(s+2)}$
	B	$\dfrac{K}{s(s-1)(s+2)}$
	C	$\dfrac{K}{(s+1)(s+2)}$
	D	$\dfrac{K}{s(s+1)(s-2)}$

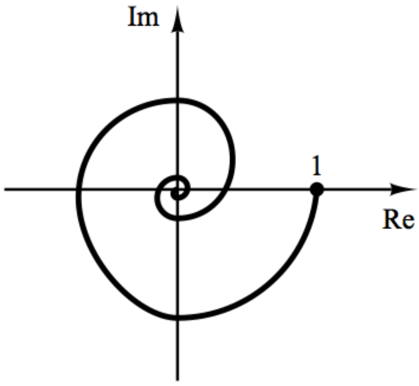
Q.24



This Log-magnitude curve represents a transfer function of the form:

A	$\dfrac{K_1}{s\left(K_2 s + K_3\right)}$
B	$\dfrac{K_1}{\left(s + K_4\right)\left(K_2 s + K_3\right)}$
C	$\dfrac{K_1}{\left(K_2 s + K_3\right)}$
D	$\dfrac{K_1}{s\left(s + 1\right)}$

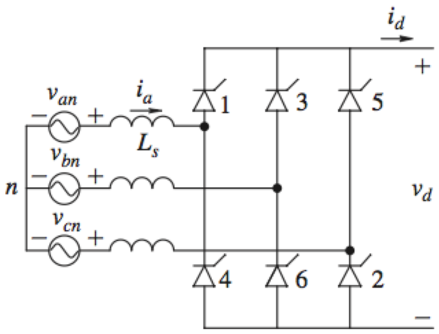
Q.25



The polar plot shown in the figure is of a transfer function of the form:

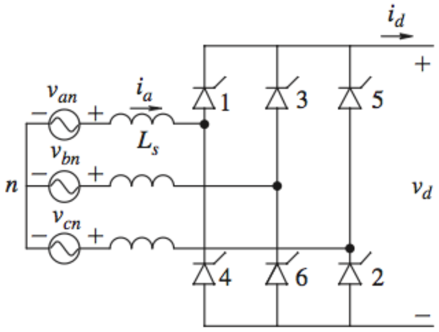
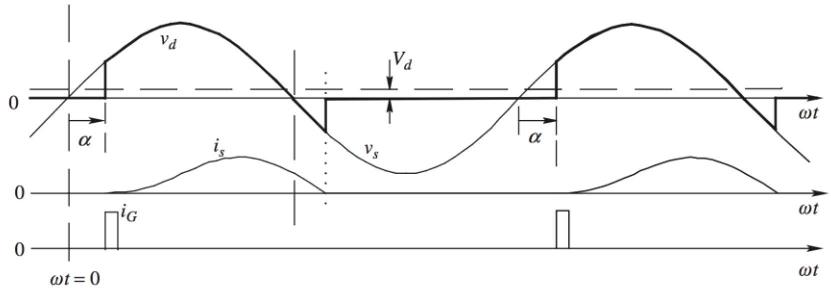
A	$\frac{1}{(ts+1)}$
B	e^{-jas}
C	$\frac{e^{-jas}}{(ts+1)}$
D	$\frac{e^{-jas}}{(ts^{20}+1)}$

Q.26

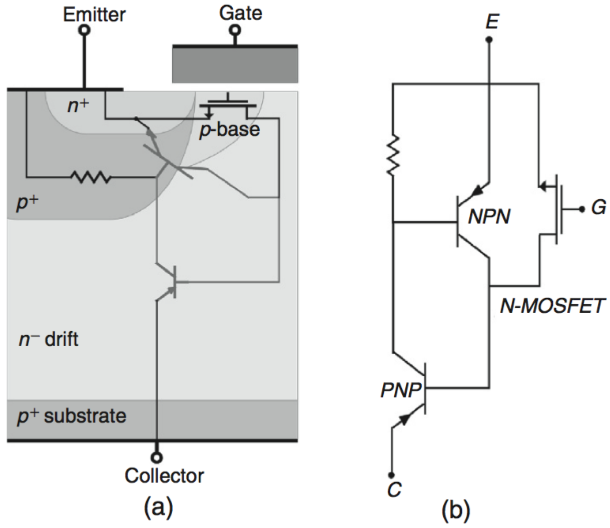


The peak value of the output voltage with negligible source inductance L_s is given by the expression:

A	$\frac{1}{p}(V_{LL})_{max}$
B	$\frac{2}{p}(V_{LL})_{max}$
C	$\frac{4}{p}(V_{LL})_{max}$
D	$\frac{3}{p}(V_{LL})_{max}$

Q.27	 The effect of source inductance is :	
	A	Increase of the DC output voltage in the output
	B	Increase in the harmonics at the input
	C	Reduction in the current harmonics at the input
	D	Reduction in the voltage harmonics at the input
Q.28	In a single-phase thyristor converter, V_S =120 V (rms) at 50 Hz, and the firing angle α=45^{o}. This converter is supplying 1kW of power. The dc-side current i_d can be assumed purely dc. The average DC output voltage is :	
	A	76.4
	B	54
	C	64
	D	84
Q.29	 The load current waveform shown in the figure is of a single phase fully controlled converter. It has a :	
	A	Purely Resistive load.
	B	Purely Inductive Load.
	C	Load with small R/L ratio.
	D	Load with large R/L ratio.

Q.30



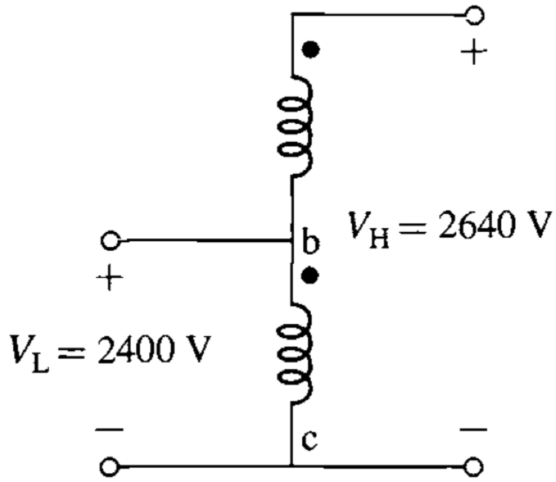
The equivalent circuit shown above represents an:

A	Power MOSFET with parasitic transistors
B	Power Darlington with parasitic transistors
C	IGBT
D	GTO

Q.31 Identify the correct expression for regulation of a transformer

A	$r = e_x \cos q + e_r \sin q$
B	$r = e_x \sin q + e_r \cos q$
C	$r = e_x \cos q - e_r \sin q$
D	$r = e_r \cos q - e_x \sin q$

Q.32

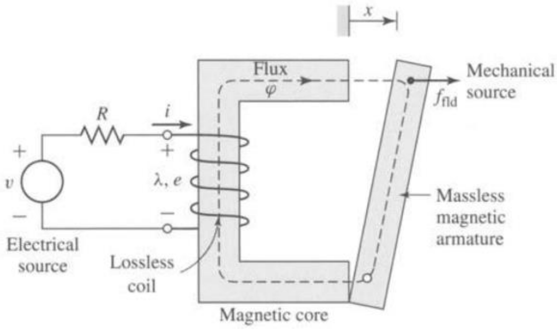


A 2400:240-V 50-kVA transformer is connected as an autotransformer, as shown in the figure. The kVA rating is:

A	550
B	50
C	100
D	150

Q.33		By introducing a very small air gap in the magnetic circuit of a transformer the primary side power factor will
	A	Increase
	B	Remain same
	C	Become negative
	D	Decrease

Q.34

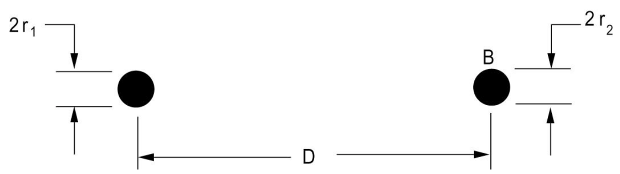


The expression for the input inductance for the above circuit can be given as: (*g* air gap; *x* is the displacement; *d* is the magnetic iron path length)

	A	$L = \dfrac{\mu_0 N^2 ld \left(1 - x/d\right)}{2g}$
	B	$L = \dfrac{\mu_0 N^2 ld}{2g}$
	C	$L = \dfrac{\mu_0 N^2 2g}{ld \left(1 - x/d\right)}$
	D	$L = \dfrac{\mu_0 N^2 2g}{ld}$

Q.35		A 500-V shunt motor takes 4 A on no-load. The armature resistance including the brushes is 0.2 ohms and the field current is 1 A. The output when it takes 100 Amp is :
	A	56 kW
	B	46 kW
	C	36 kW
	D	50 kW

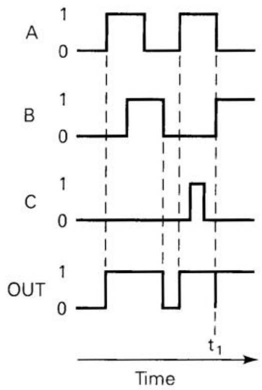
Q.36		A 12-pole 3-phase alternator is coupled to an engine running at 500 rpm. It supplies an induction motor which has a full load speed of 1440 rpm. The %slip is:
	A	1
	B	2
	C	3
	D	4

Q.37	An induction motor has efficiency of 0.9 when the load is 50hp. At this load the stator copper loss and rotor copper loss each equals the iron loss. The mechanical loss is one third of no-load loss. The slip is:	
	A	0.312
	B	0.0312
	C	0.00312
	D	3.12
Q.38	The power input to a 3-phase induction motor is 60kW. The stator losses total 1kW. The total mechanical power developed at a slip of 3%.	
	A	58.1
	B	59.02
	C	57.23
	D	56.2
Q.39	 The figure shows the transmission line with two conductors. The capacitance between the lines is given by:	
	A	$C_{AB} = \dfrac{\pi}{\ln\left(D/\sqrt{r_1 r_2}\right)}$
	B	$C_{AB} = \dfrac{\pi\varepsilon_0}{\ln\left(D/\sqrt{r_1 r_2}\right)}$
	C	$C_{AB} = \dfrac{\pi\varepsilon_0}{\ln\left(D r_1 r_2\right)}$
	D	$C_{AB} = \dfrac{\ln\left(D/\sqrt{r_1 r_2}\right)}{\pi\varepsilon_0}$
Q.40	A matching circuit in analog signal processing is used to match	
	A	voltage
	B	power
	C	impedance
	D	current
Q.41	The zero sequence components of a 3-phase system indicate	
	A	DC quantities with unequal magnitudes
	B	AC quantities with phase difference of 120 degrees
	C	AC quantities with no phase difference between them
	D	DC quantities with equal magnitude
Q.42	A 1-phase transmission line has a resistance of 0.22 ohms and an inductive reactance of 0.36 ohms. The voltage at the sending end to give 500kVA with unity power factor and at 2000 volts is:	

	A	2106 V
	B	2206 V
	C	2086 V
	D	2056 V

Q.43	The fault current is largely :	
	A	Inductive
	B	Resistive
	C	Capacitive
	D	Has angle almost 0 to the applied voltage
Q.44	The correct expression of the divergence theorem is :	
	A	$\oiint_S \mathbf{D}\cdot\mathbf{dS} = \oiiint_V (\nabla\cdot\mathbf{D})dv$
	B	$\oiint_S \mathbf{D}\cdot\mathbf{dS} = \iiint_V (\mathbf{D})dv$
	C	$\oiint_S \mathbf{D}\cdot\mathbf{dS} = \iiint_V (\nabla\cdot\mathbf{D})dv$
	D	$\oiiint_V \mathbf{D}\cdot\mathbf{dS} = \iiint_V (\nabla\cdot\mathbf{D})dv$
Q.45	The correct expression for incremental length in spherical coordinate system is	
	A	$\mathbf{dL} = dr\hat{\mathbf{a}}_{\mathbf{r}} + rd\theta\hat{\mathbf{a}}_{\boldsymbol{\theta}} + r\sin\theta d\phi\hat{\mathbf{a}}_{\phi}$
	B	$\mathbf{dL} = dr\hat{\mathbf{a}}_{\mathbf{r}} + rd\theta\hat{\mathbf{a}}_{\boldsymbol{\theta}} + rd\phi\hat{\mathbf{a}}_{\phi}$
	C	$\mathbf{dL} = dr\hat{\mathbf{a}}_{\mathbf{r}} + rd\theta\hat{\mathbf{a}}_{\boldsymbol{\theta}} + r\sin\phi d\phi\hat{\mathbf{a}}_{\phi}$
	D	$\mathbf{dL} = dr\hat{\mathbf{a}}_{\mathbf{r}} + r\sin\theta d\theta\hat{\mathbf{a}}_{\boldsymbol{\theta}} + rd\phi\hat{\mathbf{a}}_{\phi}$
Q.46	Identify the correct expression for the relationship of current density and volume charge density.	
	A	$\nabla\times\mathbf{J} = -\frac{\partial\rho_v}{\partial t}$
	B	$\nabla\cdot\mathbf{J} = \frac{\partial\rho_v}{\partial t}$
	C	$\nabla\times\mathbf{J} = \frac{\partial\rho_v}{\partial t}$
	D	$\nabla\cdot\mathbf{J} = -\frac{\partial\rho_v}{\partial t}$
Q.47	The differential form of Ampere's law is	
	A	$\nabla\times\mathbf{H} = \sigma\mathbf{J}$
	B	$\nabla\times\mathbf{H} = \mathbf{J}$
	C	$\nabla\cdot\mathbf{H} = \mathbf{J}$
	D	$\nabla\mathbf{H} = \mathbf{J}$

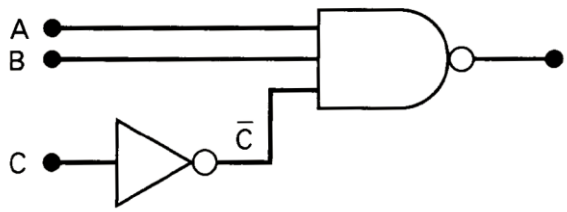
Q.48



A,B,C and OUT are the inputs and output of a 3-input, 1-output logic system respectively. Which one of the following statement is true

A	$OUT = A \oplus B + C$
B	$OUT = A \cdot B + C$
C	$OUT = A \oplus B \oplus C$
D	$OUT = A + B + C$

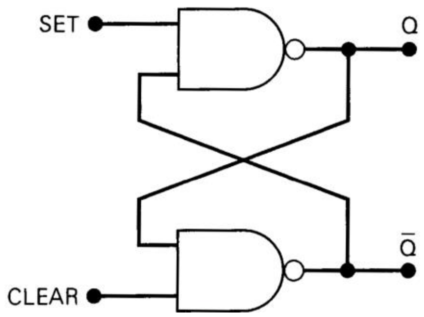
Q.49



If C is fixed at 1 and A and B are allowed to toggle from 1 to 0 simultaneously the output will be:

A	Toggling as A and B
B	Will be 1 always
C	Will be 0 always
D	Will be toggling in the opposite fashion as A and B

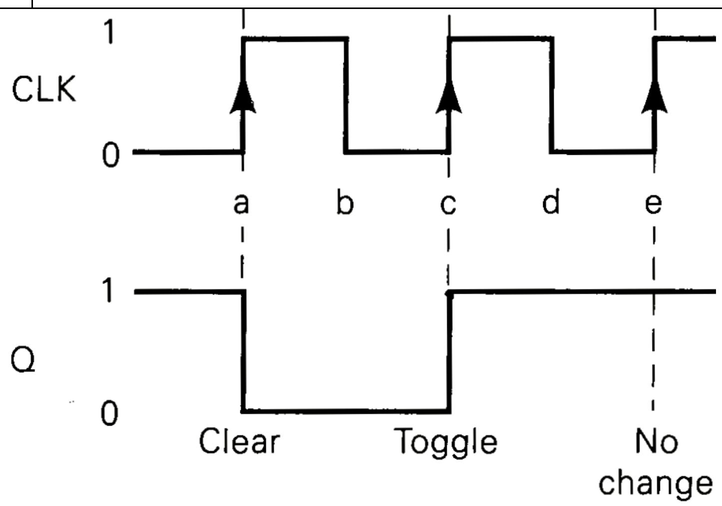
Q.50



In the circuit shown when *set* as well as *clear* are 1 then the output are:

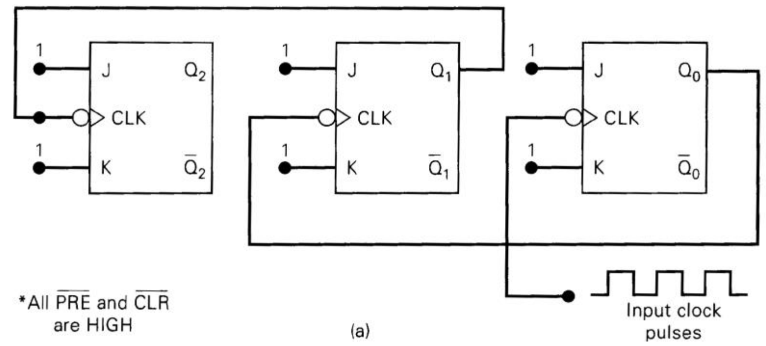
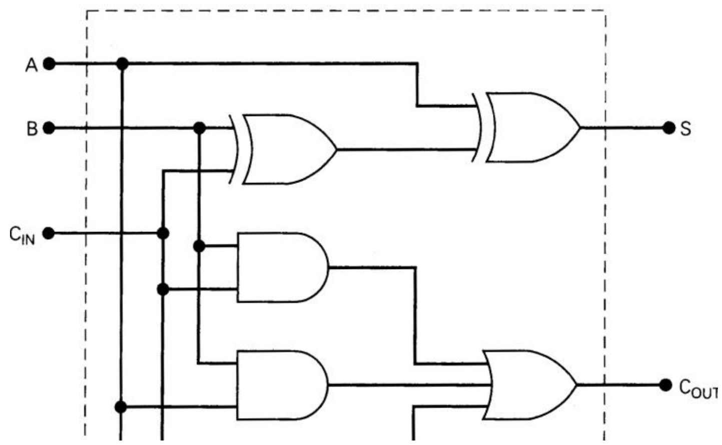
A	$Q=1; \quad \bar{Q}=0;$
B	No Change
C	Toggle
D	$Q=0; \quad \bar{Q}=1;$

Q.51



The figure show the the input and output for a J-K flipflop.
Find the value of J and K in the two clock period b to c shown for the output as shown:

A	$J=0; \quad K=1;$
B	$J=1; \quad K=1;$
C	$J=0; \quad K=0;$
D	$J=1; \quad K=0;$

Q.52	 The circuits shows a	
	A	3-bit mod-5 counter
	B	3-biut mod-6 counter
	C	3-bit binary counter
	D	3-bit up-down counter
Q.53	10111 binary number represent	
	A	-9
	B	7
	C	-7
	D	9
Q.54	 The missing logic gate in this full adder circuit is a/an	
	A	OR gate
	B	AND gate
	C	X-OR gate
	D	NOT-gate
Q.55	A fixed interrupt in a microcontroller has the following feature.	
	A	Interrupt acknowledge cycle
	B	Interrupt Table
	C	Fixed address of ISS
	D	Can be triggered by an instruction.
Q.56	A stepper motor when controlled by a microcontroller working at 5MHz can be switched with delays by decrementing (h for hexadecimal)	
	A	FFh
	B	1Fh
	C	01h
	D	FFFFh

Q.57	The instruction XRA A sets the contents of the accumulator (A) to: (h for hexadecimal)	
	A	00h
	B	FFh
	C	11h
	D	the previous value stored.
Q.58	The Fourier Transform of $x(t) = \sin \omega_o t$ is	
	A	$X(j\omega) = \frac{1}{2}\left(\delta(\omega - \omega_0) - \delta(\omega + \omega_0)\right)$
	B	$X(j\omega) = \frac{1}{2}\left(\delta(\omega - \omega_0) + \delta(\omega + \omega_0)\right)$
	C	$X(j\omega) = \frac{1}{\sqrt{2}}\left(\delta(\omega - \omega_0) + \delta(\omega + \omega_0)\right)$
	D	$X(j\omega) = \frac{1}{\sqrt{2}}\left(\delta(\omega - \omega_0) - \delta(\omega + \omega_0)\right)$
Q.59	The Laplace transform will exist for systems which are	
	A	Nonlinear
	B	Linear and Time Variant
	C	Linear and Time Invariant
	D	Only Linear and Time Invariant and Stable
Q.60	A periodic triangular wave of time period of 10 ms needs to be sampled. The theoretical sampling frequency should be:	
	A	200 Hz
	B	500 Hz
	C	100 Hz
	D	Infinity