University of Mumbai
Examination 2020 under cluster 2 (FRCE)

Program: SE Electronics and Telecommunication Engineering

Curriculum Scheme: Revised 2016 (Choice Based)

Examination: Second Year Semester III

Course Code: **ECC304** and Course Name: **Circuit Theory and Networks**

Time: **1 hour** Max. Marks: **50**

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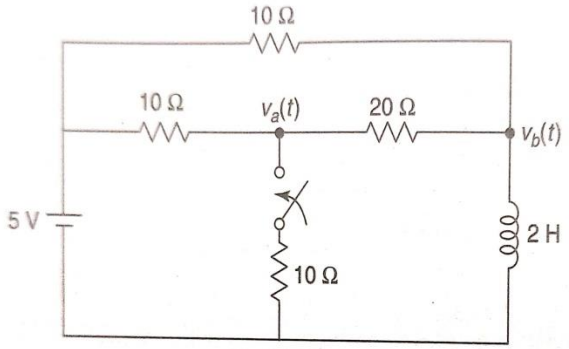
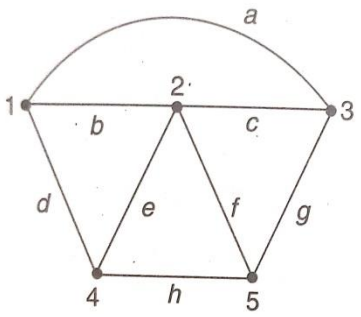
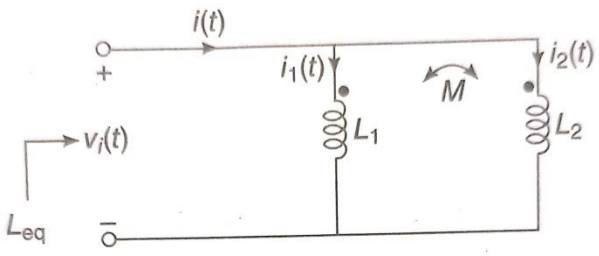
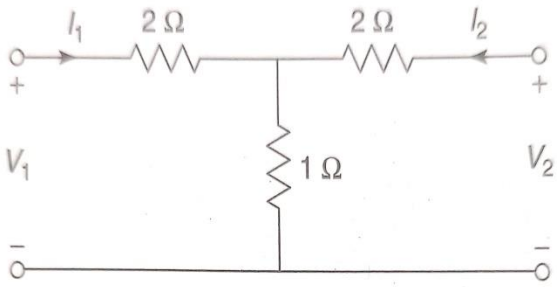
Note to the students:- All Questions are compulsory and carry equal marks .

Q1.	When two coils having self-inductance of L1 and L2 are coupled through a mutual inductance M, the coefficient of coupling k is given by
Option A:	$k = \frac{M}{\sqrt{2L_1 L_2}}$
Option B:	$k = \frac{M}{\sqrt{L_1 L_2}}$
Option C:	$k = \frac{2M}{\sqrt{L_1 L_2}}$
Option D:	$k = \frac{\sqrt{L_1 L_2}}{M}$
Q2.	Superposition theorem is not applicable to networks containing
Option A:	Non-linear element
Option B:	Dependent voltage Source
Option C:	Dependent current source
Option D:	Transformers.
Q3.	Find the state of capacitor when there is no voltage across the capacitor at $t=0^-$
Option A:	Capacitor will act as an open circuit at $t=0^+$
Option B:	Capacitor will act as a short circuit at $t=0^+$
Option C:	Capacitor will act as a voltage source of V_0 volt at $t=0^+$
Option D:	Capacitor will act as a current source of I_0 ampere at $t=0^+$
Q4.	Find the statement which is not true for a tree of a graph
Option A:	A tree contain all nodes of the graph
Option B:	If n is the number of nodes of the graph, then n branches should be there in the tree
Option C:	Tree do not contain any loop
Option D:	There exists only one path between any pair of nodes in a tree.
Q5.	The damping ratio of a series RLC circuit can be expressed as
Option A:	$\frac{R^2 C}{2L}$

Option B:	$\frac{2L}{R^2C}$
Option C:	$\frac{R}{2}\sqrt{\frac{C}{L}}$
Option D:	$\frac{R}{2}\sqrt{\frac{L}{C}}$
Q6.	The mutual inductance between two coupled coils is 20mH. If the turns in one coil are doubled and that in the other are halved then the mutual inductance will be
Option A:	5mH
Option B:	10mH
Option C:	40mH
Option D:	20mH
Q7.	In the given network a steady state is reached with the switch open. At t = 0, the switch is closed .For the element values given determine value of $V_a(0^-)$. 
Option A:	3.33V
Option B:	0V
Option C:	1.9V
Option D:	-0.477V
Q8.	Find the statement which is not true
Option A:	When all the poles lie in the left half of the s plane ,the network is said to be stable
Option B:	When there are multiple poles on the jw axis, the network is said to be stable
Option C:	When the poles lie on the jw axis the network is said to be marginally stable
Option D:	When poles lie in the right half of the s plane, the network is said to be unstable
Q9.	The graph of an electrical network has n nodes and b branches. The number of links with respect to the choice of a tree is given by
Option A:	b – n + 1
Option B:	b + n
Option C:	n – b + 1
Option D:	n – 2b – 1

Q10.	If a unit step voltage is applied at t = 0 to a series RL circuit with zero initial conditions
Option A:	It is possible for the current to be oscillatory
Option B:	The voltage across the resistor at t= 0^+ is zero
Option C:	The energy stored in the inductor in the steady state is zero
Option D:	The resistor current eventually falls to zero
Q11.	Identify which of the following is not a tree of the graph shown in figure 
Option A:	begh
Option B:	defg
Option C:	abfg
Option D:	Aegh
Q12.	The denominator polynomial in a transfer function may not have any missing terms between the highest and the lowest degree, unless?
Option A:	all odd terms are missing
Option B:	all even terms are missing
Option C:	all even or odd terms are missing
Option D:	all even and odd terms are missing
Q13.	The function $S + 2 + \frac{3}{S}$ can be realized as
Option A:	Both driving point impedance and driving point admittance
Option B:	An impedance but not as admittance
Option C:	An admittance but not as an impedance
Option D:	Neither as an impedance nor as an admittance
Q14.	Find the equivalent impedance for the circuit given 

Option A:	$\frac{L_1L_2 - M^2}{L_1 + L_2 + 2M}$
Option B:	$\frac{L_1L_2 + M^2}{L_1 + L_2 + 2M}$
Option C:	$\frac{L_1L_2 - M^2}{L_1 + L_2 - 2M}$
Option D:	$\frac{L_1L_2 + M^2}{L_1 + L_2 - 2M}$
Q15.	Two identical sections of the network are connected in series.Obtain Z parameters of the overall connection 
Option A:	$\begin{matrix}3 & 1\\ 1 & 3\end{matrix}$
Option B:	$\begin{matrix}1 & 3\\ 3 & 1\end{matrix}$
Option C:	$\begin{matrix}6 & 2\\ 2 & 6\end{matrix}$
Option D:	$\begin{matrix}9 & 1\\ 1 & 9\end{matrix}$
Q16.	Consider the impedance function$z(s) = \frac{2s^2+8s+6}{s^2+8s+12}$. Find the value of R_1 after converting into second Cauer form.
Option A:	1
Option B:	¾
Option C:	½
Option D:	¼
Q17.	For an RC driving point impedance function, the poles and Zeros
Option A:	Should alternate on the real axis
Option B:	Should alternate only on the negative real axis
Option C:	Should alternate on the imaginary axis
Option D:	Can lie anywhere on the left half plane
Q18.	Which of the following ABCD parameters is unit less?
Option A:	A and B
Option B:	A and D
Option C:	B and C
Option D:	A and C

Q19.	Find the value of Y_{12} for a given impedance matrix $\begin{matrix} 4/5 & -4/5 \\ 2/5 & -12/5 \end{matrix}$
Option A:	½
Option B:	-1/2
Option C:	3/2
Option D:	2/3
Q20.	Find the polynomial which is not a Hurwitz $P_1(s)= 2s^6 + s^5 + 13\ s^4 +6s^3 +56s^2 + 25s+ 25$ $P_2(s) = 2s^4 +5s^3 +6s^2 +3s +1$ $P_3(s) = s^4 + 7s^3 +6s^2 +21s+8$
Option A:	$P_1(s)$ and $P_2(s)$
Option B:	$P_2(s)$ and $P_3(s)$
Option C:	$P_1(s)$
Option D:	$P_3(s)$
Q21.	Find the resultant Y parameter Matrix for parallel connected two port network is
Option A:	$\begin{matrix} Y_{11} & Y_{12} \\ Y_{21} & Y_{22} \end{matrix} = \begin{matrix} Y_{11}' + Y_{11}'' & Y_{12}' + Y_{12}'' \\ Y_{21}' + Y_{21}'' & Y_{22}' + Y_{22}'' \end{matrix}$
Option B:	$\begin{matrix} Y_{11} & Y_{12} \\ Y_{21} & Y_{22} \end{matrix} = \begin{matrix} Y_{11}' & Y_{12}' \\ Y_{21}' & Y_{22}' \end{matrix} \text{ x } \begin{matrix} Y_{11}'' & Y_{12}'' \\ Y_{21}'' & Y_{22}'' \end{matrix}$
Option C:	$\begin{matrix} Y_{11} & Y_{12} \\ Y_{21} & Y_{22} \end{matrix} = \begin{matrix} Y_{11}'Y_{11}'' & Y_{12}'Y_{12}'' \\ Y_{21}'Y_{21}'' & Y_{22}'Y_{22}'' \end{matrix}$
Option D:	$\begin{matrix} Y_{11} & Y_{12} \\ Y_{21} & Y_{22} \end{matrix} = \frac{1}{2} \text{ x } \begin{matrix} Y_{11}'Y_{11}'' & Y_{12}'Y_{12}'' \\ Y_{21}'Y_{21}'' & Y_{22}'Y_{22}'' \end{matrix}$
Q22.	The driving point impedance of an LC network is given by $Z(s) = \frac{2S^5+12S^3+16s}{S^4+4S^2+3}$. Using first Cauer form, find the value of L_1.
Option A:	S
Option B:	2s
Option C:	3s
Option D:	4s
Q23.	A two port network is symmetrical if
Option A:	AD - BC = 1
Option B:	$Z_{11}Z_{22} - Z_{12}Z_{21} = 1$
Option C:	$h_{11}h_{22} – h_{12}h_{21} = 1$
Option D:	$Y_{11}Y_{22} – Y_{12}Y_{21} = 1$
Q24.	A voltage waveform $V(t) = 12t^2$ is applied across a 1 H inductor for t≥0, with initial

	current through it being 0. The current through the inductor for t greater than 0 is
Option A:	12t
Option B:	24t
Option C:	$12t^3$
Option D:	$4t^3$
Q25.	A 1 µF capacitor is connected across a 50 V battery. The battery is kept closed for a long time. The circuit current and voltage across capacitor is
Option A:	0.5 A and 0 V
Option B:	20 A and 5 V
Option C:	0 A and 50 V
Option D:	0.05 A and 5 V